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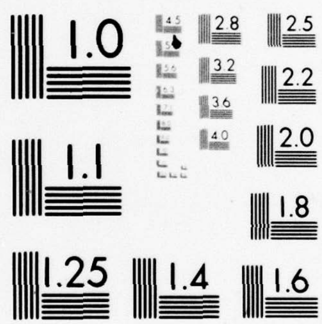

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AN EXERCISE OF THE DYNAMIC
STUDENT FLOW MODEL

by

William E. Caves
Dicky Wieland
W. L. Wilkinson

Serial T-398
21 May 1979

The George Washington University
School of Engineering and Applied Science
Institute for Management Science and Engineering

Program in Logistics

Contract N00014-75-C-0729
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The Dynamic Student Flow Model is a computer-based system using network flow theory for producing solutions with the maximum throughput of flight students with the minimum time to train. A principal result is the input and output schedule plus a variety of data for analyses of the jet, prop, and helo pipeline flows. This paper documents the results of exercising the model on six distinctly different scenarios. Each scenario emphasizes some particular capability of the model, illustrating its flexibility at the executive, staff,

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Table of Contents

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AN EXERCISE OF THE DYNAMIC STUDENT FLOW MODEL

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1. Introduction

1.1 Problem background - Changes in policy dictated by higher authority coupled with fluctuations in Congressionally authorized funds, available training aircraft, PCS funds, student pilot accessions, fleet force levels, squadron manning levels, and pilot continuation rates have kept naval aviation training in a constant state of flux. Many of these changes occur on very short notice and require an urgent response at senior command levels. The present training management system handles each of these demands on an ad hoc basis, generally by sending requests through the chain of command for statements of expected impacts and recommendations for accommodating action. Accommodating plans rely heavily on intuition garnered from long association with the flight training community. Impact statements are generated for these intuitive plans after long and laborious hand computation of student flow resulting from these assumptions. In order to respond in the time allowed, most calculations are based upon broad assumptions and crude planning factors. Results are equally crude approximations of impact and are neither subject to audit nor reproducible at a later date. Predicted impacts are thus often accorded little weight by authorities directing changes.

The dominant indicator of historic change in flight training requirements is the annual Pilot Training Rate (PTR). Figure 1.1 delineates the precipitous changes in this 'bottom line' index brought about by external demands on the system. Also displayed in Figure 1.1 are the actual PTRs as a measure of the system's response to the changing requirements. (This figure was provided through the courtesy of the Staff, Naval Education and Training Command.)

Aside from the crisis situation created in the training system by the external perturbations referred to above, there are enough factors inherent in the flight training process to inhibit the efficacious flow of students through the system. Environmental factors alone are a continuing significant consideration. Implementing technological advances in aircraft, flight simulators, and flight support training techniques lead to changes in flight hours, syllabi, and the allocation of primary resources. The list of influences leading to internal changes to the system could go on and on. The resulting imperfect scheduling of flight training involves a major drain on manpower assigned to naval aviation. Training conducted by the Naval Air Training Command (NATRACOM) and the Fleet Readiness Squadrons (FRSs) consumes about one-third of the total resources available to the entire naval aviation establishment. Frequent changes and the dynamics of the student flow process present the planning, management, and operating process with details of such magnitude as to defy any kind of systematic manual treatment.

1.2 <u>Requirement</u> - It has been recognized that a system needs to be devised which can provide dynamic scheduling of student flows in response to changing Navy needs. This system must consider not only throughput requirements for trained pilots, but the capacity of each segment of the training pipeline as well. The capacity to generate flight hours for training is influenced by many factors, some uncontrollable and others controllable. To name a few, there are the environmental factors of weather and daylight hours per day. In the NATRACOM this usually creates a larger capacity to train in summer than in winter so that the student population experiences an accordion-like action as it

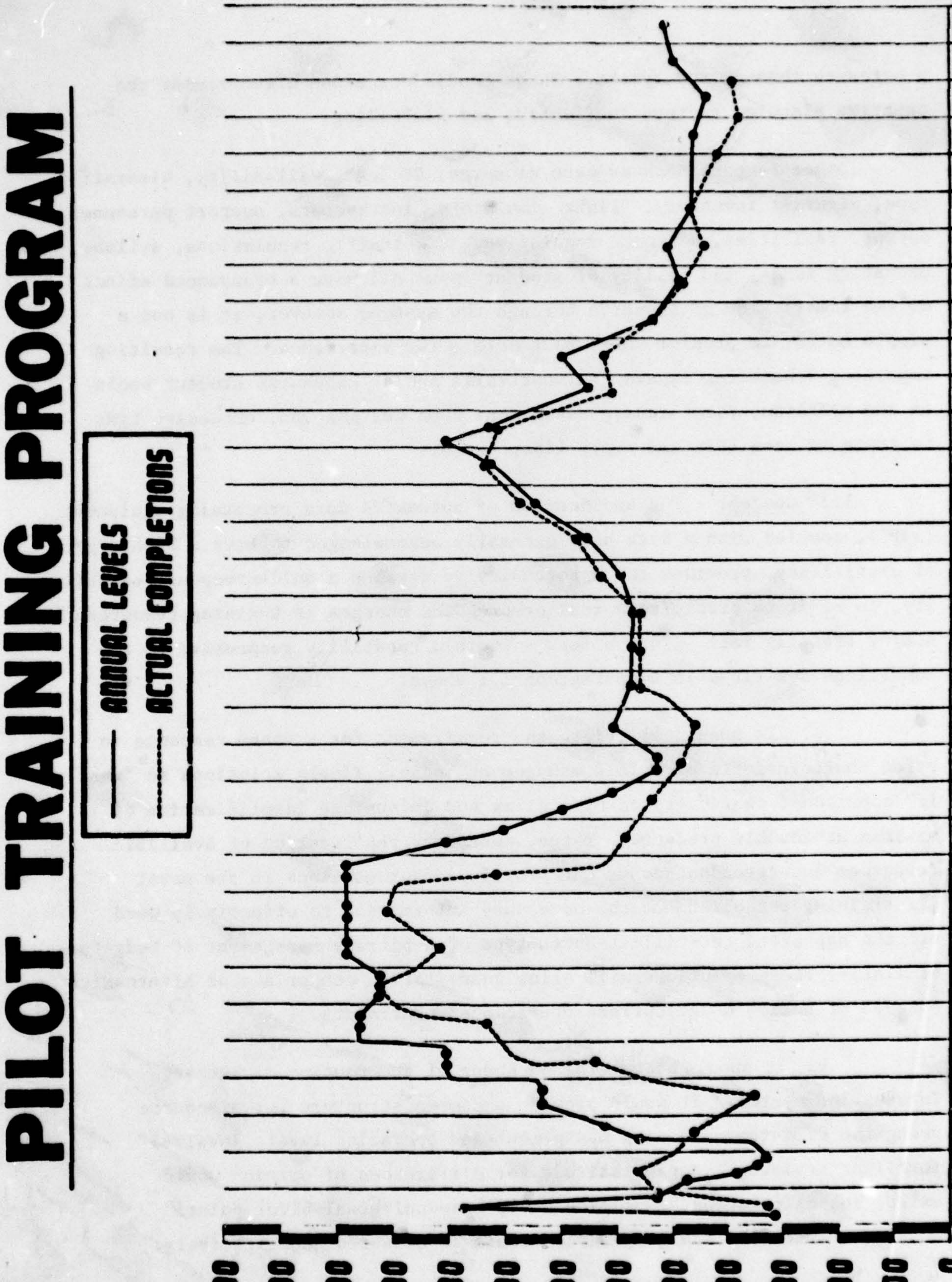

PILOT TRAINING PROGRAM
ANNUAL LEVELS
ACTUAL COMPLETIONS
3900
3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81

Figure 1.1

progresses through the system. These conditions alone often render the putative planning factors ineffective and misleading.

Other factors such as base closures, CV deck availability, aircraft type, aircraft inventory, flight simulators, instructors, support personnel, support facilities, airspace regulations, air traffic regulations, syllabi, operating funds, and quality of student input all have a pronounced effect on the timely flow of students through the system; however, it is not a simple matter to predict the impact before the experience. The resulting imperfect scheduling causes PTR shortfalls and/or expensive student pools in the NATRACOM, diversionary assignment upon designation, excessive time to train in some FRSs and empty fleet seats.

1.3 Concept - The application of automated data processing equipment (ADPE), coupled with a data base generally acknowledged to have a high degree of credibility, provides the opportunity to develop a quick-response capability, to react to precipitous real or proposed changes in training resources and/or training rate. This offers a twofold capability responsive to the conditions described in subparagraph 1.1 above.

a. It should alleviate the requirement for a spasm response so often characteristic of crisis management today. Timely solutions to "what if" questions, characterized by a clear and defensible identification of maximum achievable production rates, necessary reallocation of available resources and attendant costs can provide senior echelons in the naval air training establishment the necessary information to effectively ward off the haphazard cut-till-it-hurts type of arbitrary management of budgets. Similarly, these solutions will allow quantitative comparison of alternative sources of action under current operational contraints.

b. It should become the backbone of the routine management information system. It would provide a common structure for discourse among the different planning management and operating levels involved in flight training. Ample latitude for differences of opinion would exist, but differences of opinion would have universal pivot points where the effect of the differences could be measured quantitatively.

Alternative courses of action could be evaluated for internal and external command decisions. As the routine function becomes more dominant, the function in (a) above should diminish in its frequency of applications.

An automated management information system is viewed as a coherent family of models covering a wide range of considerations and objectives. In no sense is such a system seen as a "push button" solution to management situations. The system would project the results of a plan, but would not produce the plan itself. Managers should continue to manage and such a system will provide much better tools for getting their job done. The effective implementation of the system would require a staff member to have intimate knowledge of a model's data requirements and its treatment of those data to meet certain objectives. As one step in this direction, a Dynamic Student Flow Model (DSFM) was developed.

1.4 DSFM - The DSFM is a computer-based system for producing flight student input and output schedules including data for analyses of internal pipeline flows. The schedules are produced for a time period of interest, say five years, and reflect the given planning criteria, e.g., level monthly output. The structure of the DSFM is a network where the arcs represent the various phases and locations of training phases. Every arc in the network has a time duration and capacity to train parameter which is applicable at the actual week of entry into the phase. This feature lends the dynamic dimension to the model. Since we allow these parameters to vary with each week of entry into each phase, there is a large number of individual phase arcs in any network of real interest. In addition, there are arcs for student input and output plus arcs for the students already on board. At the heart of the DSFM is a rigorous, optimizing algorithm which ensures that every solution delivers the maximum output of graduates under the stated conditions (constraints). Moreover, of all maximum output solutions (should there be more than one), the given solution has the minimum total time to train. The algorithm which guarantees these two properties, i.e., max flow-min time, is referred to as the "General Minimal Cost Flow" algorithm in Reference [1]. With respect to these two properties, any requirements or performance projections

would be very defensible even under the most critical scrutiny.

The current version of the DSFM is a primitive step towards a more versatile model. The term of reference for this version is PATHFINDER. Considerable manual calculations on the input data are required to make the inputs acceptable to PATHFINDER. Also, it is important to spend some time in investigating ways of improving the computer running times of the model. Even during the preparation of this report, considerable improvements have been made in automatically producing a wide range of summary reports on DSFM solutions. The detail in the DSFM solutions is enormous and for some staff analyses, this level of detail will be important. For other purposes, minimum detail with identification of trends would suffice. It is recognized that the desired levels of aggregation on DSFM solutions will be many and varied.

1.5 Capabilities - The use of the DSFM through a responsive data processing system would give the Navy the following particular capabilities.

a. Produce a schedule of student inputs by week over a one-to-five-year projected period stating the requirements for an optimal student flow through all the pipelines. When the expected scenario changes, a new schedule could be produced with minimum effort and time. If only the annual Pilot Training Rate (PTR) is changed, then the new schedule could be produced with no additional staff effort.

b. Determine the maximum throughput of the training system for a given scenario.

c. Determine capacity to train required by weeks, phase, and location to produce a given set of PTRs.

d. Determine where the training bottlenecks are in the system.

e. Determine where excess capacities exist in the system.

f. Determine the surge capacity of the system if additional personnel, spare parts, funds, etc., were made available to increase the aircraft

utilization.

g. Determine the expected number of student-weeks spent in pools, and their location, which will result from a given plan or policy.

h. Provide information leading to improved PTR assignments to training wings and squadrons.

i. Provide data for staff analysis leading to improved pipeline balancing of capacities to train by phase and location.

j. Provide expected tracks for students to follow as they enter the system at a particular week.

k. Provide a measure of the effect of different planning policies and scheduling criteria; e.g., level input, level output, uniform student loading.

1.6 Previous work - Reference [2] is the most recent report on DSFM, covering its exercise on a number of scenarios concerning base closings and squadron decommissionings. While this current report is meant to be self-sufficient from the nontechnical user's perspective, a more technical description of how the student flow network is constructed is contained in Reference [2].

1.7 Current work - The six scenarios involved in this report have as a common setting the training phase structure of the existing undergraduate flight training system for naval aviators. For the reader who is not familiar with the current program, it may avoid some confusion later with respect to some terms of reference if a skeletal description of this system is given as part of the prelude. To that end, Figure 1.2 is offered.

During the preparation of this paper, there was concurrent developmental activity on the model and exercises of the model on new scenarios. The use of some earlier terms of reference became regrettable as work progressed but in the interests of uniformity they were not changed. Notably among these is the reference to JET or STRIKE training at CORPUS

Phase ID	Phase Name	Naval Air Station	Comments
PR	Primary	Whiting FL Corpus Christi TX	The initial phase of flight training. A screening process prepatory to being assigned to pipeline training.
PP	Phased Primary	Whiting FL Corpus Christi TX	An abbreviated primary phase given only to jet pipeline students. A temporary expediant.
IS	Intermediate Strike	Kingsville TX Chase TX Meridian MS Pensacola FL	The basic jet training phase.
AS	Advanced Strike	Same as IS	The advanced and final phase of jet training.
IP	Intermediate Maritime/Helo	Whiting FL Corpus Christi TX	An intermediate phase in propellor driven aircraft prepatory to entering the advanced prop phase or primary helo phase.
MT	Maritime	Corpus Christi TX	The advanced and final phase of multi-engine prop training.
PH	Primary Helo	Whiting FL	The initial phase of rotary wing training.
AH	Advanced Helo	Whiting FL	The advanced and final phase of rotary wing training.

Figure 1.2

and WHITING JET training is not conducted at either of these bases. What was intended is the area, i.e., Kingsville and Chase are in the CORPUS area and Meridian and Pensacola are in the WHITING area, at least in a relative sense. These terms also appear in the machine produced printouts. Rather than change the input data and the written text throughout, it was opted to ask for the reader's forebearance with the caveat that CORPUS jet training is conducted at Kingsville and Chase; and WHITING jet training is conducted at Meridian and Pensacola.

2. Scenarios

This paper documents the results from the exercise of the DSFM on six distinct scenarios. This section will describe each of the six scenarios.

2.1 Scenario No. 1 - This scenario focuses attention on the consolidation of the Undergraduate Helo Pilot Training (UHPT) at Ft. Rucker. Figure 2.1 lists chronologically the major events for this transition as set forth in an existing CNATRA scenario. The existing scenario is geared to an undesignated D-date. For purposes of exercising the DSFM, a D-date of 1 October 1979 was assigned.

Certain additional conditions are pertinent to a fuller description of Scenario No. 1. They are the following ones.

a. Flight operations are in a five-day peacetime mode. The results of the DSFM are based on the assumption that such peacetime planning factors as the annual aircraft utilization, average weeks-to-train for a phase, and the average total flight hours for a phase graduate are in effect.

b. The Phased Primary syllabus will be discontinued in April 1979, i.e., no more entries into Phased Primary after March.

c. The onboard student load and student pools are as reported in the 1-30 September 1978 Aviation Statistical Report.

d. Student inputs in FY79 are as scheduled in OPNAVNOTE 1542 Ch-1, Serial 591/735699, 21 JUN 78.

Scenario

The following scenario is taken from one revised by Op-59 in March 1978. The beginning of FY80 has been assumed as D-day for the consolidation of helo training.

1 Oct 79 Wk 1	CNO issue OPNAVNOTE 5450 for Ft. Rucker Navy Helicopter Training Command BUPERS slates personnel for Rucker cadre
19 Nov 79 Wk 8	BUPERS issues orders on personnel for Rucker cadre Negotiate host-tenant agreement for UHPT consolidation
28 Jan 80 Wk 18	Host-tenant agreement for UHPT consolidation signed 2B24(N) trainer facility available at Ft. Rucker for trainer instaliation Commence 2B24(N) Trainer Installation
3 Mar 80 Wk 23	Initial component of NHTC in place at Ft. Rucker. Commence USN H55 instructor standardization IUT at Ft. Rucker
2 May 80 Wk 31	NAVSCOLSCOM completes last class to input Navy UHPT
5 May 80 Wk 32	USN cadre in place at Ft. Rucker
16 May 80 Wk 33	NAVSCOLSCOM completes first class input Rucker UHPT Commence phase-down of VT-27
19 May 80 Wk 34	First USN/USMC students commence Rucker UHPT
16 Jun 80 Wk 38	Commence contact flight USN/USMC instructors IUT at Ft. Rucker 2B24(N) installed and RFT Ft. Rucker
30 Jun 80 Wk 40	Commence instrument flight USN/USMC instructors IUT at Ft. Rucker

Figure 2.1a

14 Jul 80 Wk 42	Initial group of USN/USMC instructors assume instructor duties in consolidated UHPT at Ft. Rucker
8 Sep 80 Wk 50	Commence night flight USN/USMC instructors IUT at Ft. Rucker
10 Oct 80 Wk 53	Last USN/USMC students complete intermediate prop (Helo) Complete VT-27 phase-out
14 Oct 80 Wk 54	HT-8 commences phase-down Commence common tactics USN/USMC instructors IUT at Ft. Rucker
31 Oct 80 Wk 57	VT-27 disestablished
7 Nov 80 Wk 58	Last USN/USMC students complete HT-8 TH-57 contract maintenance no longer required. Complete HT-8 phase-down Commence service unique USN/USMC instructors IUT at Ft. Rucker
10 Nov 80 Wk 59	HT-18 commences phase-down
5 Dec 80 Wk 62	HT-8 disestablished
6 Feb 81 Wk 71	Last USN/USMC students designated at HT-18. Complete HT-18 phase-down
13 Feb 81 Wk 72	First USN/USMC students designated Ft. Rucker USN/USMC instructor complement at full strength at Ft. Rucker
6 Mar 81 Wk 75	HT-18 disestablished

<u>Note</u>: Two Christmas holiday leave periods are included in this scenario, therefore a four-week slippage is included in the week number.

Figure 2.1b

e. The following PTR requirements apply.

	FY79	FY80	FY81	FY82	FY83
JET	570	506	542	560	560
PROP	342	363	369	387	387
HELO	574	597	590*	NA	NA
TOTAL	1,486	1,466	1,501	947	947

*Shortfall is to be expected since UHPT at NAS Whiting will be operative only part of year.

The primary purpose of exercising the DSFM on Scenario No. 1 is to provide information relevant to the following questions.

a. Is the time phasing of the scenario feasible in relation to meeting the PTR requirements?

b. What are the time phased outputs to be expected with the programmed aircraft inventories?

c. What is the earliest shutdown of VT-27 and the consequent retirement schedule for the T-28?

d. Where are the large pockets of student pooling, if any?

2.2 Scenario No. 2 - This is the same as Scenario No. 1 with the following two changes.

a. All phases except Maritime go to a six-day week of flying activity starting 1 March 1979. It is estimated that this extension of flight activity will lead to a 13% increase in productive flight hours per aircraft.

b. The student inputs to the Naval Aviation Schools Command (NASC) during FY79 will be reduced by 100 Aviation Officer Candidates (AOC) during the third and fourth quarters of FY79 and 111 Marines according to the following schedule:

Limit to 12/class during 1/15 - 4/9
Limit to 10/class during 4/16 - 4/23
Limit to 9/class during 4/30 - 9/24

This scenario was an outgrowth of the results from Scenario No. 1 wherein there were large pools of students waiting to enter Primary and significant shortfalls in the PTR. The intent of Scenario No. 2 is to determine the quantitative effects of stretching out the work week and restricting the number of student inputs during FY79.

2.3 Scenario No. 3 - This scenario is the same as No. 1 (peacetime mode) except the reduced input of No. 2 is in effect. The intent of this exercise is to determine the number of aircraft necessary to meet the PTR requirements for FY80 and beyond for JET and PROP. Since UHPT is discontinued in FY81, a shortfall is expected in that year; however, the PTR for FY80 should be met.

2.4 Scenario No. 4 - This scenario assumes that UHPT will not be consolidated at Ft. Rucker during the time frame FY80 - FY85, i.e., Figure 2.1 does not apply. Peacetime planning factors apply. The Phased Primary syllabus is discontinued at the end of FY79. The PTR is limited solely by the number of available aircraft. The problem is to determine the approximate number of aircraft required under the peacetime mode of operations to meet the following expanded PTR requirements.

	FY80	FY81	FY82	FY83-85
JET	506	560	597	644
PROP	363	383	416	425
HELO	597	608	638	702
TOTAL	1,466	1,551	1,651	1,771

2.5 Scenario No. 5 - This scenario is basically that of No. 1 with the following exceptions.

a. The consolidation of UHPT does not occur.

b. The reduced student inputs for Scenario No. 2 are further reduced during FY79 starting 12 March by the following amourts.

150 Navy officers
69 Foreign officers

c. The PTRs have been expanded to the following:

	FY79	FY80	FY81	FY82	FY83
JET	570	506	552	552	570
PROP	342	363	369	369	379
HELO	574	597	655	655	672
TOTAL	1,486	1,466	1,576	1,576	1,621

d. Normal downstream attrition from entry into NASC to graduation for FY79. No attrition for first quarter FY80 entries and 17.6% for remainder of FY80.

The intent of this scenario is to produce a new schedule of student inputs into NASC for FY79 (starting 12 March) and FY80 under these new conditions.

2.6 Scenario No. 6 - The intent of this scenario is to provide a realistic setting for computing the student input schedule into NASC for FY80. Some of the planning factors have been changed substantially from those for Scenario No. 1; notably, the aircraft utilizations and the phase attritions.

Using Scenario No. 1 as a frame of reference, the following changed conditions are noted.

a. UHPT will not be consolidated.

b. No entries into Phased Primary beyond September 1979.

c. The disestablishment of VT-27 will not occur before the end of FY81.

d. The 2F129 trainer for the T44A will become ready for training during FY80.

e. The expanded PTRs of Scenario No. 5 are invoked.

f. The total system downstream attrition of 17.6% is to be used for all years.

Two different student input schedules for FY80 are required. The student input schedule for FY79 is fixed as currently scheduled by Op-59. The following are the two schedules required of the DSFM.

a. The weekly inputs of Navy and USMC officers are specified. The remaining categories of students are given as totals only, which must be admitted into NASC during FY80. The DSFM is free to select the best time for these entries.

b. No totals of student categories are given. The DSFM is free to schedule students into the Primary phase in a way which will maximize the number of pipeline grads in the minimum time to train.

During the course of exercising the DSFM on Scenario Numbers 6a and 6b, above, the intensity of flight operations was greatly increased at NAS Whiting North in the Primary phase of T34C flight training. It was projected that the increased output of phase graduates from Phased Primary and Primary would yield 42 phase grads per week for the combined output at Corpus and Whiting until the end of FY79. The current average output in the DSFM is 32 total. This increased output was to start during the week of 19 March 1979. As a consequence, it was requested that Scenarios 6a and 6b be repeated but with the increased output during weeks 25 through 52 of FY79. The new scenarios are referred to as 6c for 6a and 6d for 6b, respectively.

3. Inputs

3.1 Required inputs - The following inputs are required as source data to prepare the input parameters for the DSFM network.

a. PTRs for the three or more years following the start of the date for the DSFM exercise.

b. A list of the training phases and their sequence in the flight training process. Include delay times, if any, for each phase-to-phase transition. For all of the scenarios entertained in this exercise, Figure 3.1 delineates the relevant network.

c. For each phase, location, and type aircraft:

(1) average weeks to train
(2) attrition rate
(3) average total flight time per phase graduate
(4) percentage of flyable weather by month
(5) daylight hours by month.

d. Aircraft inventories by type, phase, and location by quarter of each fiscal year during the time period of interest (TPOI).

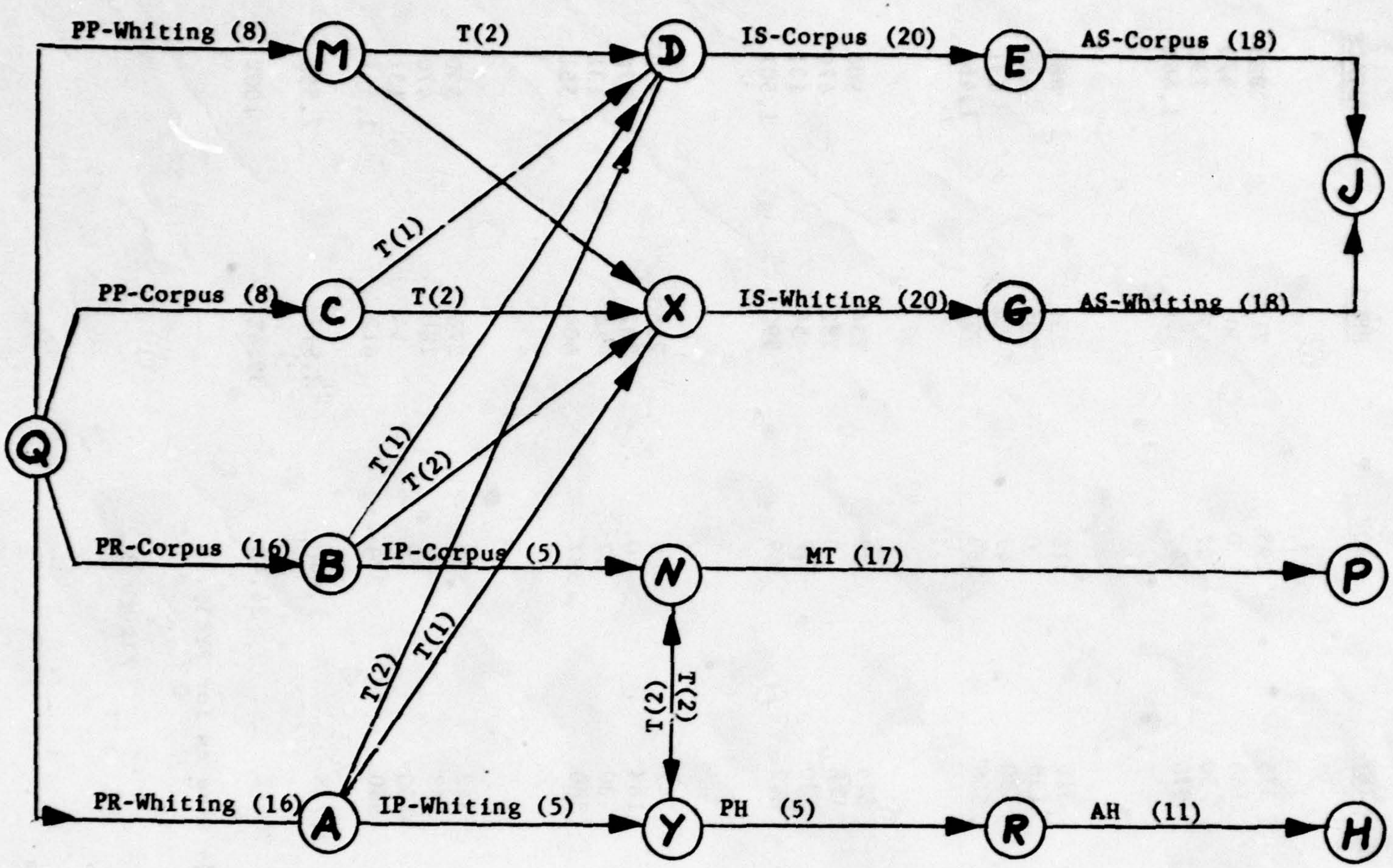
e. Student onboard load and student pools by phase and location as of the start date of the DSFM exercise.

f. Student input schedule into the NASC or into Primary flight training. If no such schedule is given, unlimited student entries are permitted. The DSFM solution then contains the optimum student input schedule into Primary flight training.

3.2 Computed data - The "Required Inputs" in 3.1 above provide the source data for computing a variety of data essential to the proper operation of the DSFM. As discussed earlier, the PATHFINDER version of the DSFM requires a considerable amount of manual data manipulation to achieve a scenario representation in the DSFM network. A priority effort is underway to reduce this requirement to a minimum.

a. PTRs - These are totaled for the number of years for which they are given. Then the percentages for each of the JET, PROP, and HELO pipelines are calculated. Figure 3.2 lists the PTRs over the five years FY79 through FY83. These PTRs apply to Scenario Numbers 1, 2 and 3.

NETWORK NAME: TRANS



PP: Phased Primary
PR: Primary
IP: Intermediate Prop/Helo
MT: Maritime

IS: Intermediate Strike
AS: Advanced Strike
PH: Primary Helo
AH: Advanced Helo

Note: Number in parentheses is the number of weeks duration on the average. The "T" arcs are transit arcs, e.g., T(2) could be a change of station from Corpus to Whiting requiring two weeks to accomplish. For the Strike phases, Corpus is to be interpreted to include Kingsville and Chase; Whiting to include Meridian and Pensacola.

Figure 3.1

PILOT TRAINING RATE (PTR) FY79-83

	JET	PROP	HELO	TOTALS
FY79				
NAVY	375	295	215	885
MARINE	165	0	305	470
CG&F	30	47	54	131
TOTALS	570	342	574	1,486
FY80				
NAVY	318	316	251	885
MARINE	158	0	292	450
CG&F	30	47	54	131
TOTALS	506	363	597	1,466
FY81				
NAVY	324	322	254	900
MARINE	188	0	282	470
CG&F	30	47	54	131
TOTALS	542	369	590	1,501
FY82				
NAVY	342	340	268	950
MARINE	188	0	282	470
CG&F	30	47	54	131
TOTALS	560	387	604	1,551
FY83				
NAVY	342	332	276	950
MARINE	188	0	282	470
CG&F	30	47	54	131
TOTALS	560	379	612	1,551
5-YR TOTAL	2,738	1,840	2,977	7,555
5-YR PERCENTAGES	36.2%	24.4%	39.4%	100%

Note: PTR for FY84 same as for FY83.

Figure 3.2

Figure 3.3 gives the PTRs over the six years FY80-FY85 for Scenario Number 4. These pipeline percentages are a factor in calculating downstream attritions and the allocation of the same type aircraft among phases. This will be brought out more fully in the sequel.

b. Downstream attrition - Downstream attrition represents the expected loss in the number of phase graduates before final graduation from UPT. The projected PTRs and the proportionate share of the total by each of the three pipelines figure into the calculation of downstream attrition. The proportion of each pipeline would not matter if it were not for the sharing of such phases as Primary and Intermediate Prop/Helo. Figure 3.4 illustrates this attrition for the time period that the Phased Primary syllabus is active. The phase labeled "Primary and Intermediate" is to contain the remainder of Primary not in the Phased Primary plus the Intermediate Prop/Helo phase. Phase attritions are also given in Figure 3.4. Similarly, Figure 3.5 covers the downstream attritions where the Phased Primary syllabus has been discontinued. Figures 3.4 and 3.5 apply to Scenario Numbers 1, 2 and 3. Figure 3.6 was created for use in Scenario Number 4.

c. Pipeline graduates - Internal calculations in the DSFM are executed in units of UPT graduates. This is the current technique for coping with the attrition problem in network flows. There are alternative approaches, of course, but this one has served well in a pragmatic sense. The purist could well argue that this method infringes on the strict optimum character of the solution and he would be correct in theory. In real quantitative results, the maximum likely variation is trivial. Moreover, the exigent literature offers little in the way of algorithms that cope with losses and gains in network flows. Reference [3] is one of the better known of these works. The PATHFINDER version of the DSFM already has limitations in computer storage and running times. A more sophisticated algorithm, however satisfying to the theorist, could only aggravate those practical considerations.

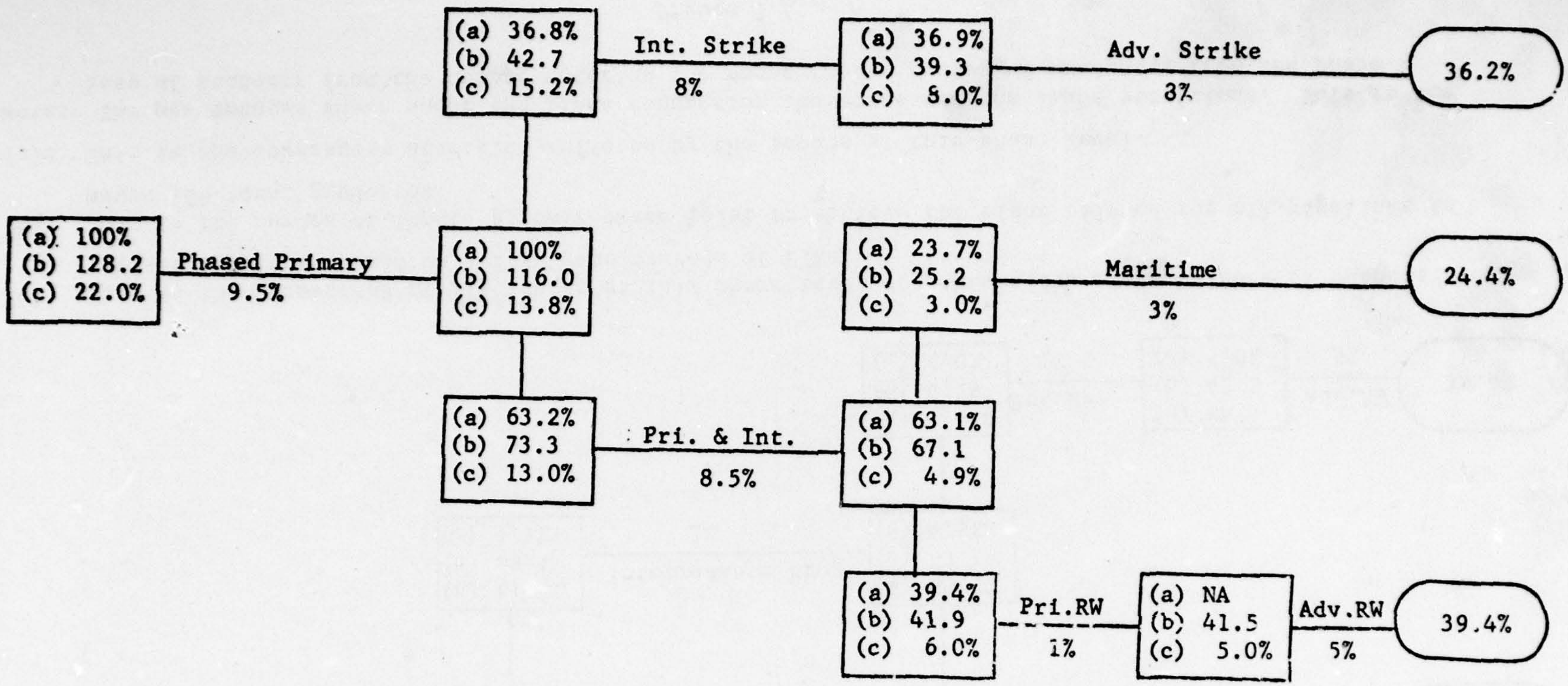
Figure 3.7 tabulates the factors that enter into the determination

EXPANDED
PILOT TRAINING RATE (PTR)
FY80-85

	JET	PROP	HELO	TOTALS
FY80				
NAVY	318	316	251	885
MARINE	158	0	292	450
CG&F	30	47	54	131
TOTALS	506	363	597	1,466
FY81				
NAVY	338	336	266	940
MARINE	192	0	288	480
CG&F	30	47	54	131
TOTALS	560	383	608	1,551
FY82				
NAVY	371	369	290	1,030
MARINE	196	0	294	490
CG&F	30	47	54	131
TOTALS	597	416	638	1,651
FY83-FY85				
NAVY	411	378	351	1,140
MARINE	203	0	297	500
CG&F	30	47	54	131
TOTALS	644	425	702	1,771
6-YR TOTAL	3,595	2,437	3,949	9,981
6-YR PERCENTAGES	36.0%	24.4%	39.6%	100%

Figure 3.3

DOWNSTREAM ATTRITION



(a): This is the percentage of all inputs at this phase level to achieve the right balance of outputs for all pipelines based on a five year average of PTR's.

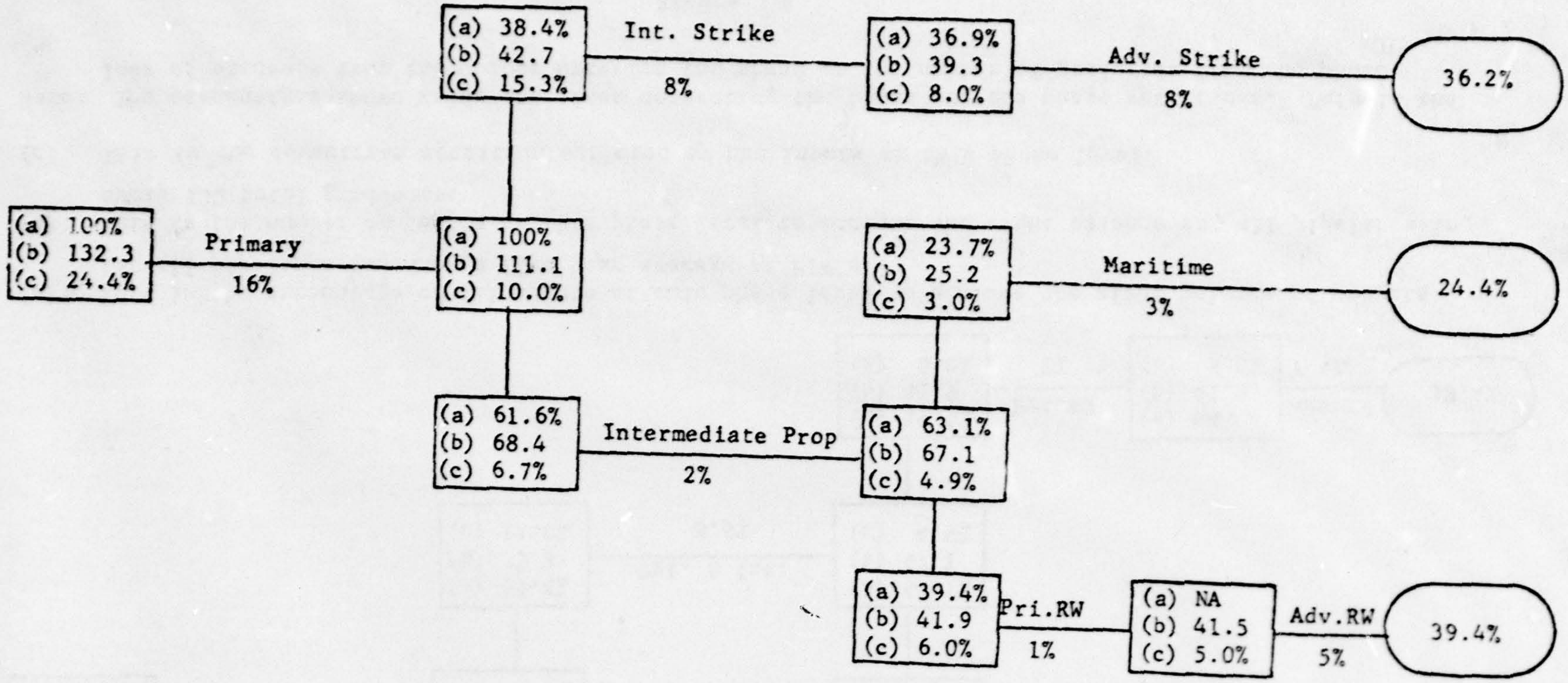
(b): This is the number of inputs at this phase level to achieve the right balance for all pipelines in every 100 total graduates.

(c): This is the downstream attrition suffered by the inputs at this phase level.

Note: The percentages shown under the lines connecting the boxes are the phase attritions. This is the loss of students from the number entering the phase to the number of graduates from the phase.

Figure 3.4

DOWNSTREAM ATTRITION



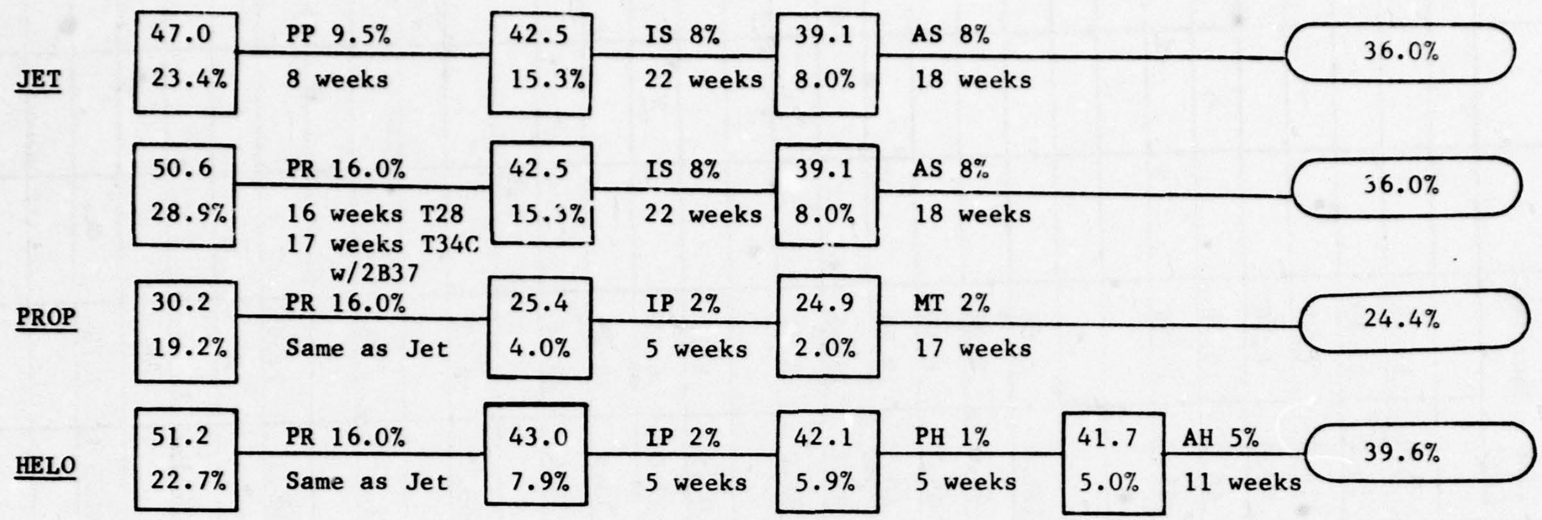
(a): This is the percentage of all inputs at this phase level to achieve the right balance of outputs for all pipelines based on a five year average of PTRs.

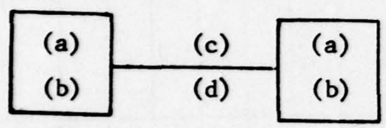
(b): This is the number of inputs at this phase level to achieve the right balance for all pipelines in every 100 total graduates.

(c): This is the downstream attrition suffered by the inputs at this phase level.

Note: The percentages shown under the lines connecting the boxes are the phase attritions. This is the loss of students from the number entering the phase to the number of graduates from the phase.

Figure 3.5





(a): This is the number of inputs at this phase level to achieve the right balance for all pipelines in every 100 total graduates.

(b): This is the downstream attrition suffered by the inputs at this phase level.

(c): Phase ID and attrition.

(d): Average phase duration. An average of two weeks is added to all pipeline lengths indicated here to account for transit times between phases and stations.

PHASE IDs

PP: Phased Primary

PR: Primary

IS: Intermediate Strike

AS: Advanced Strike

IP: Intermediate Prop

MT: Maritime

PH: Primary Helo (Rotary)

AH: Advanced Helo (Rotary)

Downstream Attrition

Figure 3.6

PHASE NAME	Type Aircraft	Flight Hours per Aircraft per Year	Flight Hours per Phase Grad	Downstream Attrition	Flight Hours per Pipeline Grad	Pipeline Grads per Aircraft per Year
WITH PHASED PRIMARY						
Phased Primary	T34C*	800	43.1	15.3	50.9	15.72
(PP)	T28	622	42.5	15.3	50.2	12.39
Primary	T34C*	800	109.5	6.3	116.9	6.84
(PR)	T28	622	86.2	6.3	92.0	6.76
Intermediate	T34C*	800	38.4	4.4	40.2	19.90
Maritime/Helo	T28	622	29.8	4.4	31.2	19.94
(IP)						
WITHOUT PHASED PRIMARY						
PR	T34C*	800	109.5	9.9	121.5	6.58
	T34C	800	87.0	9.9	96.6	8.28
	T28	622	86.2	9.9	95.7	6.50
IP	T34C*	800	38.4	4.4	40.2	19.90
	T34C	800	29.9	4.4	31.3	25.56
	T28	622	29.8	4.4	31.2	19.94
WITHOUT PHASED PRIMARY AND UHPT						
PR	T34C	800	87.0	11.1	97.9	8.17
	T28	622	86.2	11.1	97.0	6.41
IP	T34C	800	29.9	2.0	30.5	26.23
	T28	622	29.8	2.0	30.4	20.46
Intermediate	T2C	543	134.0	8.0	145.7	3.73
Strike (IS)						
Advanced	TA4	580	144.7	0.0	144.7	4.01
Strike (AS)						
Maritime (MT)	T44A	800	108.3	0.0	108.3	7.39
Primary Helo	TH57	643	42.1	5.0	44.3	14.51
(PH)						
Advanced Helo	TH1	578	80.5	0.0	80.5	7.18
(AH)						

*without 2B37

Figure 3.7

of pipeline graduates for the following conditions.

(1) with Phased Primary

(2) without Phased Primary

(3) without Phased Primary and UHPT

The calculations in Figure 3.7 use the peacetime planning factor for aircraft utilization. Any number could be substituted. The rationale for the number is important to the validity of the results of the DSFM but not to its operation.

The next factor is the total flight hours per phase graduate, a normal planning factor. This includes the syllabus hour plus all the other overhead hours necessary to his training. The breakdown of the kinds of flight activity which are included in the overhead hours is treated in detail in CNATRA management instructions. It is only necessary here to understand that <u>all</u> flight activity is included in the total flight hours per phase graduate.

Flight hours per pipeline graduate are a product of flight hours per phase graduate inflated by the downstream attrition.

Pipeline graduates per aircraft are, then, the annual aircraft utilization divided by the flight hours per pipeline graduate. These values are fundamental to all the results for Scenario Numbers 1-6.

d. <u>Aircraft inventories</u> - The programmed inventories of training aircraft are obtained from various sources. The most supportable projections available are tabulated in Figure 3.8. The availability of flight trainers (FIT & OFT) is very significant to the productivity of the actual aircraft on board. This is particularly true in the case of newly introduced aircraft, e.g., the T34C. In Figure 3.7, there is a substantial difference between the average required flight hours per phase graduate with and without the 2B37 trainer.

In allocating aircraft of the same type among phases, the pipeline percentages of the total PTR again play a part. Both the T28 and the T34C

AIRCRAFT INVENTORIES

	Type A/C	FY79				FY80				FY81				FY82			
		Q1	Q2*	Q3	Q4	Q1	Q2	Q3	Q4#	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
TOTAL - Whiting	T34C	138	145	151	153	152	151	153	161	169	170	169	168	167	166	165	165
	2B37					3	7	10	13	13	13	13	13	13	13	13	13
Phased Primary	T34C	20	21	0													
Primary	T34C	88	92	124	126	125	125	126	133	150	151	149	149	148	147	146	146
Intermediate	T34C	30	32	27	27	27	26	27	28	19	19	19	19	19	19	19	19
TOTAL (Max.Avail)	T28	94	94	94	94	93	93	92	92	85	72	62	53	42	29	16	4
Whiting:																	
Phased Primary	T28	7	7	0													
Primary	T28	25	25	34	34	0											
Intermediate	T28	9	9	7	7	0											
Corpus:																	
Phased Primary	T28	9	9	0													
Primary	T28	33	33	43	43	77	77	76	76	75	64	55	47	37	26	14	3
Intermediate	T28	11	11	10	10	16	16	16	16	10	8	7	6	5	3	2	1
Maritime - Corpus	T44A	34	40	46	52	55											
	2F/29					1	2	3	4								
Primary Helo	TH57	20	20	21	27	27	28										
Advanced Helo	TH1	61															
Int. Strike	T2C	Constant inventories: Kings - 44, Chase - 46, Merid. - 34, Pensacola - 15															
Adv. Strike	TA4	Constant inventories: Kings - 49, Chase - 48, Merid. - 31, Pensacola - 13															

*Planned to terminate Phased Primary in April, FY79.

#No more entries into Primary Helo after Week 51, FY80.

VT27 disestablished end of FY80.

Note: Blank entries on a line indicates a repeat of the last value entered on the left.

Figure 3.8

are allocated among Phased Primary, Primary, and Intermediate Prop/Helo. Moreover, other pertinent conditions change such as:

(1) availability of the 2B37,
(2) termination of the Phased Primary syllabus, and
(3) termination of UHPT.

The following table is a summary of these allocations based on the PTRs for FY79-83. The actual calculations behind these percentages are contained in Appendix A.

SUMMARY TABLE OF AIRCRAFT ALLOCATION BY PERCENT

With Phased Primary	Phased Primary	Primary	Intermediate
T28	17.6	61.5	20.9
T34C w/o 2B37	14.5	63.6	21.9
T34C w/ 2B37	17.7	61.6	20.7
Without Phased Primary			
T28		82.4	17.6
T34C w/o 2B37		82.2	17.8
T34C w/ 2B37		82.5	17.5
Without Phased Primary and UHPT			
T28		88.1	11.9
T34C w/ 2B37		88.7	11.3

e. Weeks to train - Given the average number of weeks to train a phase graduate, the weekly variations due to seasonal changes in the weather and daylight hours are automatically calculated by the DSFM program. This weekly time to train is defined as the expected time in weeks that a student could expect to spend in completing the phase if he enters the phase at the beginning of that particular week.

The weather factors used in this exercise are tabulated in Figure 3.9. The Phased Primary, Primary, and Intermediate Prop/Helo all share the same weather factors. Under Intermediate and Advanced Strike, the subdivision of "Corpus" is intended to include Kingsville and Chase; "Whiting" includes Meridian and Pensacola. The average daylight hours by month are listed in Figure 3.10. This table applies to all flight training bases.

Since the weeks-to-train parameter is automatically computed, an explicit description of how these computations are made is in order; but, first, a few words about the rationale underlying the calculations. It can be noted from historical data that for a phase involving flight training winter classes are, in general, longer than summer classes. It can also be noted that available daylight flyable hours (daylight hours times weather factor) are less in the winter than in the summer. Since most phases are predominately daylight flight training, the inverse relationship between available daylight flyable hours and class length is taken to be a cause and effect relationship. The assumption that the total number of required daylight flyable hours remains constant for the completion of each class without regard to the time of the year is sufficient to account for the fact that winter classes are longer than summer classes.

In the discussion below, the running variables i and j represent the day and week, respectively, of the fiscal year. Assuming that (a) each year of interest is the same, i.e., composed of exactly 52 weeks (an approximation of little consequence) and (b) the planning factors hold from year to year, these running variables take on the values:

$$i = 1, 2, \ldots, 364$$

$$j = 1, 2, \ldots, 52$$

The stepping of the running variables is defined to be:

$$[i+1] \rightarrow [(i \bmod 364) + 1]$$

$$[j+1] \rightarrow [(j \bmod 52) + 1]$$

WEATHER FACTORS*

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	AVERAGE
Primary & Intermediate													
Corpus	819	789	741	610	727	539	634	638	835	943	903	867	754
Whiting	833	735	661	627	763	588	764	787	817	734	764	766	737
Intermediate Strike													
Corpus	896	868	810	796	865	843	868	878	889	963	908	897	873
Whiting	815	806	728	737	773	744	795	841	870	765	851	782	792
Advanced Strike													
Corpus	903	920	829	824	871	834	860	830	901	959	930	912	881
Whiting	880	832	791	710	793	768	820	822	881	814	867	832	818
Advanced Maritime	948	927	865	838	903	868	907	937	928	982	960	906	914
Primary Rotary Wing	899	793	717	714	776	713	816	880	912	867	881	893	822
Advanced Rotary Wing	908	870	781	707	813	749	870	898	935	896	909	924	855

*In thousandths.

Figure 3.9

DAYLIGHT HOURS

MONTH	SUNRISE	SUNSET	DAYLIGHT HOURS/DAY
OCT	0601	1703	10.5
NOV	0624	1705	9.7
DEC	0648	1702	9.2
JAN	0657	1722	9.4
FEB	0641	1748	10.1
MAR	0611	1808	11.0
APR	0534	1827	11.9
MAY	0508	1846	12.7
JUN	0458	1902	13.1
JUL	0509	1902	12.9
AUG	0527	1842	12.3
SEP	0544	1806	11.4
			11.2 average

Figure 3.10

and the requisite planning factors are:

L Annual average class length in weeks

H_i Daylight hours on day i*

W_i Weather factor on day i*

D_i Work day factor ($1 \rightarrow$ workday, $0 \rightarrow$ non-workday)

From the above the annual average flyable hours per training week, F, may be calculated based on 50 training weeks per year (two weeks off at Christmas):

$$F = \frac{\sum_{i=1}^{364} D_i W_i H_i}{50}.$$

Therefore, the average flyable hours available to the average class of length L is F × L and it is this value that is used to determine the length of a particular class.

Identifying classes by the week they begin, the length of the jth class L_j, is defined to be:

$$L_j = n + \frac{FL - F_{nj}}{F_{(n+1)j} - F_{nj}}$$

with F_{nj} representing the flyable hours available during an n-week period beginning week j :

$$F_{nj} = \sum_{k=j}^{j+n-1} \sum_{i \epsilon k} D_i W_i H_i \quad **$$

---

*These planning factors are usually given as monthly averages. The value for day i is the same as the value for the month within which day i is contained.

** $i \epsilon k$ implies that day i is part of week k .

and the positive integer n chosen so that:

$$F_{nj} \leq FL < F_{(n+1)j}^{*} .$$

The assignment of the weeks-to-train parameter to the arc representing class j is the L_j rounded to an integer.

f. <u>Capacity to train</u> - The basic input to the DSFM is an annual average of the number of pipeline graduates per week for every phase in the system. Given this input parameter, then the weekly variations in the capacity to train for a particular phase is computed by the following formula

$$C_j = CL/L_j ,$$

where C_j is defined as the maximum class size of pipeline graduates to graduate the phase in L_j-weeks. Since all capacities have been reduced to pipeline graduates, as explained earlier, C_j is also equal to the maximum number of students entering the phase at the beginning of the jth week. C and L are the annual averages for the weekly capacity to train and time to train, respectively. Although C is an annual average, it need only be used for that portion of a year that it applies in calculating C_j. When aircraft inventories are changing, then C should also be changed for the appropriate time period. Many such changes can be seen in Figure 3.11, notably where the T34C inventory is increasing and the T28 inventory is decreasing. One can also note the substantial increase in productivity when the T34C trainer, 2B37, is added to the inventory during FY80.

Unlike L, C can be changed at any week during the time period of interest. When a phase is terminated, e.g., Phased Primary, the capacities are reduced to zero at the time when no more entries are allowed into the phase. New phases can be initiated by the reverse

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*$F_{(n+1)j}$ refers to the next week containing at least one workday.

WEEKLY CAPACITIES

	FY79				FY80				FY81				FY82 →
Whiting - T34C	Q1	Q2*	Q3	Q4	Q1	Q2	Q3	Q4#	Q1	Q2	Q3	Q4	
Phased Primary	6.3	6.6	0										
Primary	12.0	12.6	16.4	16.6	17.5	18.6	19.8	22.1	24.4	24.6	24.3	24.3	23.8
Intermediate	11.9	12.7	10.8	10.8	11.5	11.8	13.0	14.3	10.0	9.9	9.9	9.9	9.9
Whiting - T28													
Phased Primary	1.7	1.7	0										
Primary	3.4	3.4	4.4	4.4	0								
Intermediate	3.6	3.6	2.8	2.8	0								
Whiting - Combined													
Phased Primary	8.0	8.3	0										
Primary	15.4	16.0	20.8	21.1	Same as for T34C								
Intermediate	15.5	16.3	13.5	13.5	Same as for T34C								
Corpus - T28													
Phased Primary	2.2	2.2	0										
Primary	4.5	4.5	5.6	5.6	10.0	10.0	9.9	9.9	0				
Intermediate	4.4	4.4	4.0	4.0	6.4	6.4	6.4	6.4	0				
Maritime	5.0	5.9	6.8	7.7	7.7	8.1							
Primary Helo	5.8	5.8	6.1	7.8	7.8	8.1							
Advanced Helo	8.8												
Int. Strike													
Corpus	6.7												
Whiting	3.7												
Adv. Strike													
Corpus	7.8												
Whiting	3.5												

*Planned to terminate Phased Primary in April, FY79.

#No more entries into Primary Helo after Week 51, FY80.
VT27 disestablished end of FY80.

Note: Blank entries on a line indicates a repeat of the last value entered on the left.

Figure 3.11

representation.

The method for determining the value of C is independent of the operation of the DSFM. A frequent method is to base the determination on the planning factor for aircraft utilization as in Figure 3.7. The final column in this tabulation contains "Pipeline Graduates per Aircraft per Year." This factor multiplied by the programmed aircraft inventories will yield values for C . However, if the capacity to train is not constrained by the number of available aircraft, but by maintenance manning level, number of effective instructors on board, or some other resource, possibly students, then the computation for C should reflect these constraints.

The existing PATHFINDER version of the DSFM will calculate the weekly variations in capacity to train based on an average onboard student load which is held constant throughout the time period of interest. This was incorporated as part of the original design; however, since that time, nearly all the scenarios contain events that involve changes to the student onboard loads.

An alternative basis for the determination of pipeline graduates per week for a given aircraft inventory is through the exercise of a George Washington University-developed Aircraft Utilization Model for the particular training site. This model employs a Monte Carlo simulation technique in order to comprehend the numerous circumstances that affect the expected annual aircraft utilization. In a particular application, the appropriate version of the model is defined by:

a. The specified flight training base,
b. the real or projected operating circumstances, and
c. the mix and inventories of the training aircraft at the base.

Most, but not all, versions of the Aircraft Utilization Model comprehend only the daylight portion of flight operations. This introduces no significant error so long as the nighttime portion of the training syllabus is small compared to the daylight portion of the syllabus. The underlying assumption is that the night flying requirements can easily keep pace with the daylight operations. The resultant predicted aircraft

start of the 22nd week. The five columns of manual entries are for five fiscal years starting with FY79. The last column to the right is the automatically calculated time to train.

g. Student onboard load - The UPT system is roughly a year in length and, as such, about one year's input of students are in the system at any point in time. The current state of the system for purposes of starting up the DSFM is accounted for by preloading the network with a flow representing the students in the system at the beginning of the time period of interest.

If the best estimate of the distribution of onboard students is that they are evenly distributed with respect to weeks to go in phase, then the DSFM will automatically calculate this distribution. The DSFM considers the phase length in weeks for that particular time of the year and divides the number of students on board by that number of weeks minus one.* The minus one reflects the convention that no onboard student at start time has the full number of weeks to go in completing the phase. The full number of weeks are required by any students in a pool awaiting entry into the phase.

If there is reason to believe that the onboard students are not uniformly distributed in the weeks to go in phase, then the actual or estimated distribution can be manually entered in the "SOO" blank lines provided in Figure 3.13. Of course, there would be only zero entries in all "SOO" columns except the first.

The onboard student phase load and pools awaiting entry into the various phases are tabulated in Figure 3.14. These data were taken from the Aviation Statistical Report for 1-30 September 1978.

h. Scheduled student entries - The source document for the student entry schedule into the Naval Aviation Schools Command (NASC: a

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*This division does not often result in an integer value which is the only kind acceptable as an input to the DSFM. The program recognizes this and to avoid losing an onboard student might make the following distribution: 12-12-12-11-11, for example.

PR-CORPUS	S00	B17	----	----	----	----	----	14	31
PR-CORPUS	S00	B18	----	----	----	----	----	15	31
PR-CORPUS	S00	B19	----	----	----	----	----	16	31
PR-CORPUS	S00	B20	----	----	----	----	----	17	31
PR-CORPUS	S00	B21	----	----	----	----	----	18	31
PR-CORPUS	S00	B22	----	----	----	----	----	19	31
PR-WHITING	Q01	A22	15	15	21	20	20	19	41
PR-WHITING	Q02	A23	----	----	----	----	----	19	41
PR-WHITING	Q03	A24	----	----	----	----	----	19	41
PR-WHITING	Q04	A26	----	14	20	19	19	20	41
PR-WHITING	Q05	A27	----	----	----	----	----	20	41
PR-WHITING	Q06	A28	----	----	----	----	----	20	41
PR-WHITING	Q07	A29	----	----	----	----	----	20	41
PR-WHITING	Q08	A29	----	15	21	20	20	19	41
PR-WHITING	Q09	A30	----	----	----	----	----	19	41
PR-WHITING	Q10	A31	----	----	----	----	----	19	41
PR-WHITING	Q11	A31	16	16	22	21	21	18	41
PR-WHITING	Q12	A32	16	16	22	21	21	18	41
PR-WHITING	Q15	A32	17	17	23	22	22	17	41
PR-WHITING	Q16	A33	----	----	----	----	----	17	41
PR-WHITING	Q17	A34	----	----	----	----	----	17	41
PR-WHITING	Q18	A34	19	19	25	24	24	16	41
PR-WHITING	Q19	A35	----	----	----	----	----	16	41
PR-WHITING	Q20	A36	----	----	----	----	----	16	41
PR-WHITING	Q21	A36	----	20	26	25	25	15	41
PR-WHITING	Q22	A37	----	----	----	----	----	15	41
PR-WHITING	Q23	A38	----	----	----	----	----	15	41
PR-WHITING	Q24	A38	21	21	28	27	27	14	4
PR-WHITING	Q25	A39	----	----	----	----	----	14	4
PR-WHITING	Q26	A40	----	----	----	----	----	14	4

Figure 3.13a

preparatory phase before starting actual flight training) is the current OPNAVNOTE 1542 as revised. Figure 3.15 is a sample of the format of this schedule.

The existing PATHFINDER version of the DSFM starts with the entry of students into the primary phase of flight training rather than NASC. Two things must be considered before the number of students entering the primary flight phase can be determined. First, the NASC class duration to find the entry date into primary and, second, the attrition suffered while in the NASC. These factors are different for each of two groups of student inputs. The "AOC & AVROC" group goes through a 12-week Aviation Officer Candidate course with an attrition rate of 10 percent. The "all officers" group goes through a four-week aviation indoctrination course with an attrition rate of 2 percent. Figure 3.16 illustrates the manual procedure for these considerations. Figure 3.17, in turn, takes these results, sums the two groups for a common entry date into primary and reduces that input by a prorated downstream attrition of 23 percent. As discussed in section 3.2b, the prorationing involves the five-year average of each of the pipeline PTRs since the downstream attrition is different for each pipeline.

There is no technical difficulty in automating the student inputs at the NASC level. It just has not been done while developmental efforts have been directed to other segments of the DSFM. Many problems given to the DSFM involve the determination of an optimum input schedule. Working the problem backwards, so to speak, would require some unambiguous rules for the assignment of students to each of the two groups of students entering the NASC.

3.3 <u>New data for Scenario Number 6</u> - The purpose of this scenario is to provide a realistic setting for determining a viable set of student input schedules to NASC for FY80. Some substantial changes to the previous planning factors have been made, particularly to the aircraft utilizations and phase attritions. The effective set of planning factors for this scenario is tabulated in Figure 3.18. The resulting downstream attritions are delineated

PILOT TRAINING PROGRAM

FY-78 INPUT
(THIRD AND FOURTH QUARTERS)

CLCVN	CL NO	AOC				AVROC				OFFICER				USMC				USCG				FOREIGN			
		P		A		P		A		P		A		P		A		P		A		P		A	
		WK	CM	WK	CM	WK	CM	WK	CM	WK	CM	WK	CM	WK	CM	WK	CM	WK	CM	WK	CM	WK	CM	WK	CM
4/3	25	5	220			0	115			3	279			13	325			2	27						
4/10	26	0	220			0	115			1	280			6	331			0	27						
4/17	27	10	230			0	115			1	281			6	337			0	27						
4/24	28	0	230			0	115			1	282			6	343			0	27						
5/1	29	5	235			0	115			0	282			6	349			1	28						
5/8	30	0	235			0	115			1	283			6	355			0	28						
5/15	31	10	245			0	115			5	288			6	361			0	28						
5/22	32	0	245			0	115			3	291			6	367			0	28						
5/29	33	5	250			0	115			1	292			6	373			0	28						
6/5	34	0	250			0	115			1	293			6	379			0	28						
6/12	35	20	270			0	115			5	298			6	385			0	28						
6/19	36	0	270			0	115			5	303			12	397			0	28						
6/26	37	15	285			0	115			7	310			12	409			0	28						
7/3	38	0	285			5	120			5	315			12	421			11	39						
7/10	39	20	305			5	125			9	324			12	433			6	45						
7/17	40	0	305			5	130			14	338			12	445			2	47						
7/24	41	15	320			5	135			13	351			12	457			2	49						
7/31	42	0	320			0	135			5	356			12	469			0	49						
8/7	43	20	340			0	135			10	366			12	481			4	53						
8/14	44	0	340			0	135			10	376			12	493			0	53						
8/21	45	15	355			0	135			16	392			12	505			0	53						
8/28	46	0	355			0	135			15	407			12	517			0	53						
9/4	47	20	375			0	135			12	419			13	530			4	57						
9/11	48	0	375			0	135			6	425			13	543			0	57						
9/18	49	15	390			0	135			2	427			13	556			0	57						
9/25	50	0	390			0	135			8	435			13	569			0	57						
TOTAL			390				135				435				569				57				71		

NOTES:
1. P - Planned Input; A - Actual Input; CM - Cumulative Input; WK - Weekly Input.
2. Planned inputs are based upon FY-79 Pilot Training Rates and consideration of the current student pilot load. OPNAV authorization required for significant input changes.
3. AOC input does not include attrition subsequent to reporting to NAS Pensacola and prior to actual enrollment into Naval Aviation Schools Command.

Enclosure (1)

Figure 3.15

STUDENTS ENTERING NASC

DATE	Week No.	AOC & AVROC	UPT Entry Week (+12)	Net No. of Entries (-10%)	All Officers	UPT Entry Week (+4)	Net No. of Entries (-2%)		
7/10/78	41	25	1	22					
17	42	5	2	5					
24	43	20	3	18					
31	44	0	4	0					
8/7/78	45	20	5	18					
14	46	0	6	0					
21	47	15	7	14					
28	48	0	8	0					
9/4/78	49	20	9	18	29	1	28		
11	50	0	10	0	19	2	19		
18	51	15	11	13	15	3	15		
25	52	0	12	0	21	4	20		
10/2/78	1	19	16	17	17	5	17		
9	2	0	17	0	18	6	18		
16	3	21	18	19	20	7	19		
23	4	0	19	0	19	8	19		
30	5	8	20	8	19	9	19		
11/6/78	6	0	21	0	33	10	32		
13	7	18	22	16	32	11	31		
20	8	1	23	1	34	12	33		
27	9	8	24	7	42	16	41		
12/4/78	10	0	25	0	29	17	28		
11	11	20	26	18	19	18	19		
18	12	0	27	0	25	19	25		
25	13	0	28	0	0	20	0		
1/1/79	14	0	28	0	0	20	0		
8	15	0	28	0	0	20	0		
15	16	5	28	5	71/68	20	69/66		
22	17	15	29	13	66/63	21	64/61		
29	18	5	30	5	65/62	22	64/61		
2/5/79	19	10	31	9	34/31	23	33/30		
12	20	15	32	13	35/32	24	34/31		

Figure 3.16a

STUDENTS ENTERING NASC

DATE	Week No.	AOC & AVROC	UPT Entry Week (+12)	Net No. of Entries (-10%)	All Officers	UPT Entry Week (+4)	Net No. of Entries (-2%)		
2/19/79	21	10	33	9	34	25	34/31		
26	22	15	34	13	38	26	37/33		
3/5/79	23	10	35	9	22	27	22/19		
12	24	15	36	14	25	28	24/21		
19	25	10	37	9	21	29	21/18		
26	26	15	38	13	17	30	17/14		
4/2/79	27	10	39	9	20	31	20/17		
9	28	20/10	40	18/9	18	32	18/17		
16	29	10	41	9	21	33	20/17		
23	30	20/10	42	18/9	18	34	18/15		
30	31	10	43	9	17	35	17/14		
5/7/79	32	20/10	44	18/9	19	36	19/15		
14	33	5	45	5	19	37	19/16		
21	34	20/10	46	18/9	22	38	22/19		
28	35	0	47	0	27	39	26/23		
6/4/79	36	20/10	48	18/9	35	40	34/30		
11	37	0	49	0	27	41	27/24		
18	38	20/10	50	18/9	36	42	35/32		
25	39	0	51	0	33	43	32/29		
7/2/79	40	20/10	52	18/9	27	44	27/24		
9	41	0	1	0	39	45	38/35		
16	42	20/10	2	18/9	27	46	26/23		
23	43	0	3	0	27	47	26/23		
30	44	20/10	4	18/9	27	48	27/24		
8/6/79	45	0	5	0	33	49	32/29		
13	46	20/15	6	18/13	27	50	27/24		
20	47	0	7	0	29	51	28/25		
27	48	20/15	8	18/14	22	52	22/19		
9/3/79	49	0	9	0	34	1	33/30		
10	50	20	10	18	27	2	26/23		
17	51	0	11	0	27	3	27/24		
24	52	10	12	9	33	4	32/29		

Figure 3.16b

T-398

STUDENTS ENTERING PRIMARY FLIGHT

Date of Entry into UPT Primary	Week No.	AOC & AVROC	All Officers	Total	Less 23% Down-stream Attri-tion				
10/2/78	1	22	28	50	39	Plus 300 pool			
9	2	5	19	24	18				
16	3	18	15	33	25				
23	4	0	20	20	15				
30	5	18	17	35	27				
11/6/78	6	0	18	18	14				
13	7	14	19	33	25				
20	9	0	19	19	15				
27	9	18	19	37	28				
12/4/76	10	0	32	32	25				
11	11	13	31	44	34				
18	12	0	33	33	25				
25	13	0	0	0	0				
1/1/79	14	0	0	0	0				
8	15	0	0	0	0				
15	16	17	41	58	45				
22	17	0	28	28	22				
29	18	19	19	38	29				
2/5/79	19	0	25	25	19				
12	20	8	69/66	77/74	59/57				
19	21	0	64/61	64/61	49/47				
26	22	16	64/61	80/77	62/59				
3/5/79	23	1	33/30	34/31	26/24				
12	24	7	34/31	41/38	32/29				
19	25	0	34/31	34/31	26/24				
26	26	18	37/33	55/52	42/40				
4/2/79	27	0	22/19	22/19	17/15				
9	28	5	24/21	29/26	22/20				
16	29	13	21/18	34/31	26/24				
23	30	5	17/14	22/19	17/15				
30	31	9	20/17	29/26	22/20				

Ref: OPNAV NOTE 1542 Ch-1, Ser 591/735699, 21 JUN 1978.

Figure 3.17a

STUDENTS ENTERING PRIMARY FLIGHT

Date of Entry into UPT Primary	Week No.	AOC & AVROC	All Officers	Total	Less 23% Down-stream Attri-tion
5/7/79	32	13	18/17	31/30	24/23
14	33	9	20/17	29/26	22/20
21	34	13	18/15	31/28	24/22
28	35	9	17/14	26/23	20/18
6/4/79	36	14	19/15	33/29	25/22
11	37	9	19/16	28/25	22/19
18	38	13	22/19	35/32	27/25
25	39	9	26/23	35/32	27/25
7/2/79	40	18/9	34/30	52/39	40/30
9	41	9	27/24	36/33	28/25
16	42	18/9	35/32	53/41	41/32
23	43	9	32/29	41/38	32/29
30	44	18/9	27/24	45/33	35/25
8/6/79	45	5	38/35	43/40	33/31
13	46	18/9	26/23	44/32	34/25
20	47	0	26/23	26/23	20/18
27	48	18/9	27/24	45/33	35/25
9/4/79	49	0	32/29	32/29	25/22
10	50	18/9	27/24	45/33	35/25
17	51	0	28/25	28/25	22/19
24	52	18/9	22/19	40/28	31/22
10/2/79	1	0	33/30	33/30	25/23
10	2	18/9	26/23	44/32	34/25
16	3	0	27/24	27/24	21/18
23	4	18/9	32/29	50/38	39/29
30	5	0			
11/6/79	6	18/13		18/13	14/10
13	7	0			
20	8	18/14		18/14	14/11
27	9	0			
12/4/79	10	18		18	14
11	11	0			
18	12	9		9	7

Figure 3.17b

PHASE NAME	Type Air-craft	Flight Hours per Aircraft per Year	Flight Hours per Phase Grad	Phase Attri-tion (%)	Average Phase Length (weeks)
Phased Primary	T34C*	800	43.1	5.6	8
	T28	622	42.5	5.6	8
Primary	T34C*	800	109.5	5.6	16
	T34C	800	87.0	5.6	17
	T28	650	86.2	5.6	16
Intermediate	T34C*	800	38.4	2.7	5
Maritime/Helo	T34C	800	29.9	2.7	5
	T28	622	29.8	2.7	5
Intermediate Strike	T2C	594	134.1	6.0	20
Advanced Strike	TA4J	605	144.7	8.4	18
Maritime	T44A	800	108.3	1.4	17
	T44A#	800	136.0	1.4	17
Primary Helo	TH57	725	42.1	1.0	5
Advanced Helo	TH1	606	80.7	4.7	11
AOC	NASC			6.4	12
AI	NASC			1.7	4
Wt. Avg.				2.9	

*Without 2B37

#Without 2F129

Figure 3.18

in Figure 3.19. The stepwise calculations for obtaining the values for "Pipeline Grads per Aircraft per Year" are indicated in Figure 3.20.

The effective aircraft inventories are given in Figure 3.21. Note that the Phased Primary syllabus has been extended through FY79 and that the 2F129 trainer's ready-for-training date has been delayed until FY80. These aircraft inventories combined with the data in Figure 3.20 yield the weekly capacities to train in Figure 3.22.

The starting date for the DSFM was updated to the first week in February 1979 (week no. 18, FY79). The onboard student load for each phase and the pool awaiting entry into the phase were taken from the Aviation Statistical Report for 1-31 January 1979, the latest available. These are listed in Figure 3.23. Some of the phase onboard student loads have become inflated, e.g., Primary at Whiting. Starting with Scenario 6, a new and more realistic method of computing 'implied' student pools was initiated. A 'notional' onboard load was considered to be the average weekly phase capacity to train times the average phase time to train in weeks. Any onboard excess was added to the pool awaiting entry into the phase. The results of this adjustment are listed in Figure 3.24 as well as the expected number of pipeline graduates adjusted for downstream attritions.

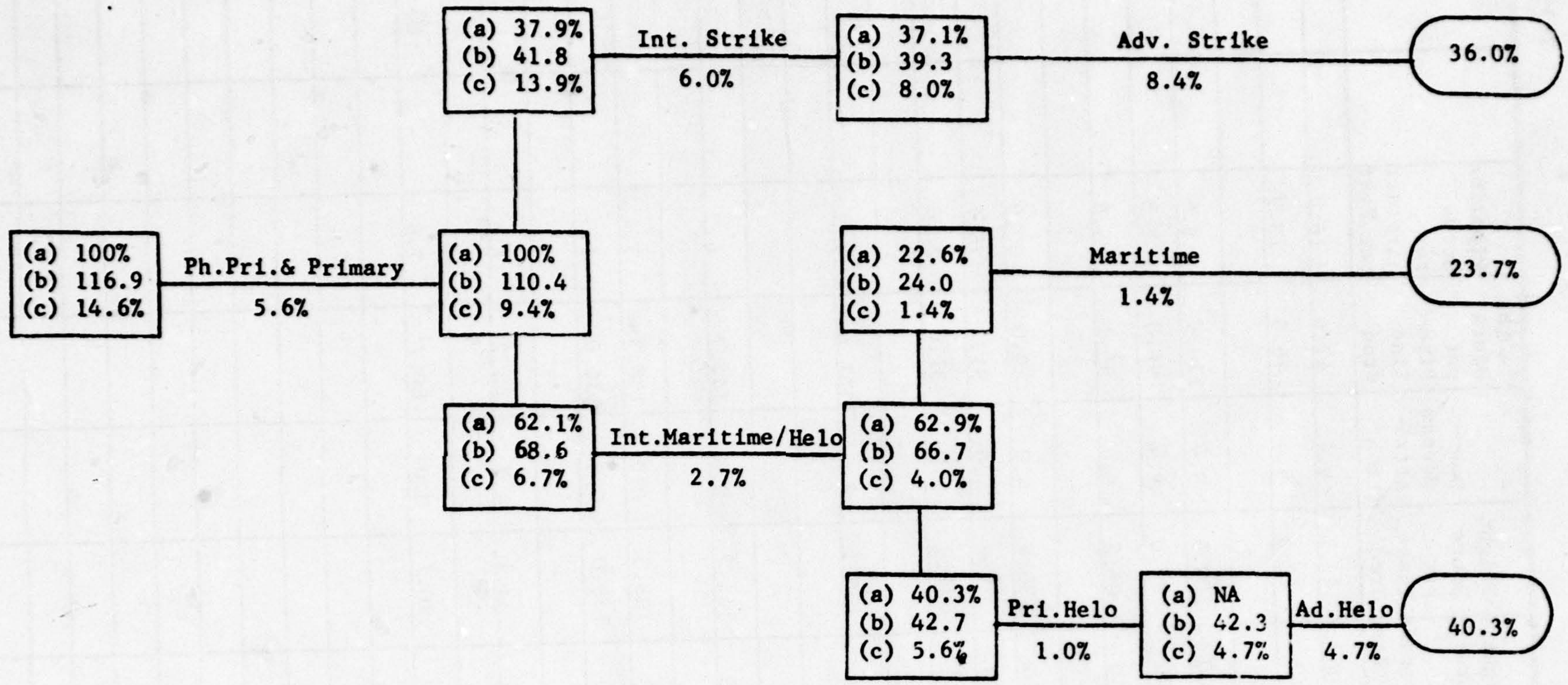
The student input schedules into NASC for FY80 as used for Scenario Number 6a is shown in Figure 3.25. There was no forced student input schedule for FY80 in Scenario Number 6b since that was to be part of the solution as derived by the DSFM. The student input schedule for FY79 produced by the DSFM for Scenario Number 5 (Figure 4.9) was applicable for both 6a and 6b.

4. Results

The results of this series of DSFM exercises will be summarized by their respective scenario.

4.1 Scenario No. 1 - This is the basic scenario with the consolidation of UHPT. The outputs of this exercise are essentially based on flight operations in a five-day peacetime mode where such planning factors as the annual

DOWNSTREAM ATTRITION



(a): This is the percentage of all inputs at this phase level to achieve the right balance of outputs for all pipelines based on a five year average of PTRs.

(b): This is the number of inputs at this phase level to achieve the right balance for all pipelines in every 100 total pipeline graduates.

(c): This is the downstream attrition suffered by the inputs at this phase level.

Note: The percentages shown under the lines connecting the boxes are the phase attritions. This is the loss of students from the number entering the phase to the number of graduates from the phase.

Figure 3.19

PHASE NAME	Type Air-craft	Flight Hours per Aircraft per Year	Flight Hours per Phase Grad	Down-stream Attri-tion	Flight Hours per Pipe-line Grad	Pipeline Grads per Aircraft per Year			
Phased Primary	T34C*	800	43.1	9.4	47.6	16.8			
	T28	650	42.5	9.4	46.9	13.9			
Primary	T34C*	800	109.5	9.4	120.9	6.6			
	T34C	800	87.0	9.4	96.0	8.3			
	T28	650	86.2	9.4	95.1	6.8			
Intermediate	T34C*	800	38.4	4.0	40.0	20.0			
Maritime/Helo	T34C	800	29.9	4.0	31.1	25.7			
	T28	650	29.8	4.0	31.0	21.0			
Intermediate Strike	T2C	594	134.1	8.4	146.4	4.1			
Advanced Strike	TA4J	605	144.7	0.0	144.7	4.2			
Maritime	T44A	800	108.3	0.0	108.3	7.4			
	T44A#	800	136.0	0.0	136.0	5.9			
Primary Helo	TH57	725	42.1	4.7	44.2	16.4			
Advanced Helo	TH1	606	80.7	0.0	80.7	7.5			

*Without 2B37 #Without 2F129

Figure 3.20

AIRCRAFT INVENTORIES

	Type A/C	FY79				FY80				FY81				FY82			
		Q1	Q2*	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
TOTAL - Whiting	T34C	138	145	151	153	152	151	153	161	169	170	169	168	167	166	165	165
	2B37					3	7	10	13	13	13	13	13	13	13	13	13
Phased Primary	T34C	22	22	22	22	0											
Primary	T34C	86	92	96	97	125	125	126	133	150	151	149	149	148	147	146	146
Intermediate	T34C	30	31	33	34	27	26	27	28	19	19	19	19	19	19	19	19
TOTAL (Max.Avail)	T28	94	94	94	94	93	93	92	92	85	72	62	53	42	29	16	4
Whiting:																	
Phased Primary	T28	7	7	7	7	0											
Primary	T28	25	25	25	25	0											
Intermediate	T28	9	9	9	9	0											
Corpus																	
Phased Primary	T28	9	9	9	9	0											
Primary	T28	33	33	33	33	77	77	76	76	75	64	55	47	37	26	14	3
Intermediate	T28	11	11	11	11	16	16	16	16	10	8	7	6	5	3	2	1
Maritime - Corpus	T44A	34	40	46	52	55											
	2F129					1	2	3	4								
Primary Helo	TH57	20	20	21	27	27	28										
Advanced Helo	TH1	61															
Int. Strike	T2C	Constant inventories: Kings - 44, Chase - 46, Merid. - 34, Pensacola - 15															
Adv. Strike	TA4	Constant inventories: Kings - 49, Chase - 48, Merid. - 31 Pensacola - 13															

*No entries into Phased Primary after September 1979.

Note: Blank entries on a line indicates a repeat of the last value entered on the left.

Figure 3.21

WEEKLY CAPACITIES

	FY79				FY80				FY81				FY82 →
Whiting - T34C	Q1	Q2	Q3	Q4*	Q1	Q2	Q3	Q4#	Q1	Q2	Q3	Q4	
Phased Primary	6.9	6.9	6.9	6.9	0								
Primary	11.8	12.6	13.1	13.3	17.5	18.6	19.8	22.1	24.4	24.6	24.3	24.3	23.8
Intermediate	11.9	12.3	13.1	13.5	11.5	11.8	13.0	14.3	10.0	9.9	9.9	9.9	9.9
Whiting - T28													
Phased Primary	1.8				0								
Primary	3.6				0								
Intermediate	3.8				0								
Whiting - Combined													
Phased Primary	8.7	8.7	8.7	8.7	0								
Primary	15.4	16.2	16.7	16.9	Same as for T34C								
Intermediate	15.7	16.1	16.9	17.3	Same as for T34C								
Corpus - T28													
Phased Primary	2.3				0								
Primary	4.7				10.0								
Intermediate	4.6				6.4								
Maritime	4.0	4.7	5.4	6.1	7.7	8.1							
Primary Helo	5.6	6.6	7.0	8.0	8.9	9.3							
Advanced Helo	9.2												
Int. Strike													
Corpus	7.4												
Whiting	4.1												
Adv. Strike													
Corpus	8.2												
Whiting	3.7												

*No entries into Phased Primary after September 1979.

Note: Blank entries on a line indicates a repeat of the last value entered on the left.

Figure 3.22

T-398

INITIAL STUDENT LOADS*

Onboard Loads	Students
Primary	
Corpus	141
Whiting	609
Intermediate Prop	
Corpus	4
Whiting	46
Intermediate Strike	
Corpus	189
Whiting	124
Advanced Strike	
Corpus	82
Whiting	44
Maritime	
Corpus	94
Primary Helo	
Whiting	36
Advanced Helo	
Whiting	72
Pools Awaiting Entry into:	
Primary	472
Intermediate Strike	
Corpus	38
Whiting	11
Advanced Strike	
Corpus	8
Whiting	2
Maritime	6

*Ref: CNATRA "Aviation Statistical Report" 1-31 January 1979.

Figure 3.23

PROPORTIONED
INITIAL STUDENT LOADS

	Students	Reduced for Downstream Attrition
Onboard Loads		
Phased Primary		
Corpus	23	18
Whiting	82	70
Primary		
Corpus	85	75
Whiting	316	269
Intermediate Prop		
Corpus	4	4
Whiting	46	43
Intermediate Strike		
Corpus	172	148
Whiting	95	82
Advanced Strike		
Corpus	82	79
Whiting	44	42
Maritime		
Corpus	77	76
Primary Helo		
Whiting	36	34
Advanced Helo		
Whiting	72	71
Pools Awaiting Entry into:		
Primary	716	609
Intermediate Strike		
Corpus	55	47
Whiting	40	34
Advanced Strike		
Corpus	8	8
Whiting	2	2
Maritime	23	23

Figure 3.24

Input Schedule to NASC
Scenario No. 6a Student

FY80 Date	Week No.	AOC	AVROC	Officers Navy	USMC	USCG	Foreign
10/1/79	1	270	130	18	10	57	0
9	2	0	0	18	10	0	0
15	3	0	0	18	10	0	0
22	4	0	0	18	10	0	0
29	5	0	0	19	10	0	0
11/5/79	6	0	0	19	10	0	0
13	7	0	0	19	10	0	0
19	8	0	0	18	10	0	0
26	9	0	0	19	10	0	0
12/3/79	10	0	0	19	10	0	0
10	11	0	0	19	11	0	0
17	12	0	0	18	11	0	0
1/14/80	16	0	0	18	11	0	0
21	7	0	0	18	11	0	0
28	8	0	0	18	11	0	0
2/4/80	9	0	0	18	11	0	0
11	20	0	0	15	11	0	0
19	1	0	0	15	11	0	0
25	2	0	0	15	11	0	0
3/3/80	3	0	0	15	11	0	0
10	4	0	0	15	11	0	0
17	5	0	0	15	11	0	0
24	6	0	0	15	11	0	0
31	7	0	0	15	11	0	0
4/7/80	8	0	0	15	11	0	0
14	9	0	0	5	10	0	0
21	30	0	0	5	10	0	0
28	1	0	0	5	10	0	0
5/5/80	2	0	0	5	10	0	0
12	3	0	0	5	10	0	0
19	4	0	0	5	10	0	0
27	5	0	0	10	10	0	0
6/2/80	6	0	0	10	10	0	0
9	37	0	0	15	10	0	0
16	8	0	0	15	10	0	0
23	9	0	0	15	10	0	0
30	40	0	0	10	10	0	0
7/7/80	1	0	0	10	10	0	0
14	2	0	0	15	10	0	0
21	3	0	0	15	10	0	0
28	4	0	0	15	10	0	0

Figure 3.25a

FY80 Date	Week No.	AOC	AVROC	Officers			
				Navy	USMC	USCC	Foreign
8/4/80	5	0	0	15	10	0	0
11	6	0	0	15	10	0	0
18	7	0	0	10	10	0	0
25	8	0	0	10	10	0	0
9/2/80	9	0	0	10	10	0	0
8	50	0	0	10	10	0	0
15	1	0	0	11	10	0	0
22	2	0	0	15	10	0	0
29	01	0	0	15	10	0	0

Figure 3.25b

aircraft utilization, average weeks to train for a phase, and the average total flight hours for a phase graduate are in effect. The following are some of the broad results.

a. Output

	FY79	FY80	FY81	FY82	FY83
JET	437	506	514	510	510
PROP	342	363	369	387	387
HELO	296	405	120	0	0
TOTAL	1,075	1,274	1,003	897	897

b. Shortfalls

	FY79	FY80	FY81	FY82	FY83
JET	133	0	28	50	50
PROP	0	0	0	0	0
HELO	278	192	470*	NA	NA
TOTAL	411	192	498	50	50

*UHPT operative only part of the year.

c. In view of the shortfalls, ancillary DSFM runs were made on the pipeline portions of the network only, i.e., excluding Phased Primary, Primary, and Intermediate Maritime/Helo phases. The results can be interpreted as the maximum pipeline flows if they could be supplied by the T34C/T28 phases in optimum time-phased quantities. The following table of results reveals that the shortfalls are not due to the T34C/T28 inventories alone.

Maximum Pipeline Output

	FY79	FY80	FY81	FY82	FY83
JET	437	506	514	510	510
PROP	342	363	369	387	387
HELO	302	405	120	0	0
TOTAL	1,081	1,274	1,003	897	897

On closer analysis of the DSFM output, which is week-by-week, it can be seen that the bottlenecks are the primary aircraft (T34C/T28) during FY79 and the first half of FY80. The Intermediate Strike (T2C) and the Primary Helo (TH57) are in short supply throughout the FY79-81 time frame.

d. Notwithstanding the shortfalls in (b) above, the time phasing of the scenario in Figure 2.1 is feasible.

e. With the last input from NASC to UHPT on 2 May 80 (starting week 32), the last student will graduate from HT-18 (Advanced Helo) at the end of week 20, FY81, 13 February 81. The last entry into Advanced Helo on week 5, FY81, starts the phase down of HT-18.

f. With the last input into VT-27 (Primary T28) at the beginning of week 33, FY80, 16 May 80, the last student will graduate from the phase at the end of week 45, 4 August 80.

g. It takes until week 26, FY80, 24 March 80, to absorb the FY79 scheduled inputs plus the pool of students (370) awaiting entry into Primary. There are 690 student-years in pools during FY79 alone with 340 of these awaiting entry into Primary. A substantial number of the student weeks in pools is a product of pushing the capacity to train to the limit for certain phases. The DSFM is seeking the maximum student flow through the system in trying to meet the PTR. It is likely that the final small percentage of graduates involve a high penalty in student pools. This is not inconsistant with real life when you push any system to its ultimate limit.

4.2 Scenario No. 2 - This scenario is the same as No. 1 except that the student inputs have been reduced during FY79 and the work week has been extended to six days. The intent of this scenario was to determine the quantitative effect on the output and student pooling. See Paragraph 2.2 for a description of Scenario No. 2.

a. The following was the output in terms of PTRs.

Output	FY79	FY80	FY81	FY82	FY83
JET	444	506	542	560	560
PROP	342	363	369	387	387
HELO	312	439	133	0	0
TOTAL	1,098	1,308	1,044	947	947

b. Shortfalls

JET	126	0	0	0	0
PROP	0	0	0	0	0
HELO	262	158	457*	0	0
TOTAL	388	158	457*		

*UHPT operative only part of the year.

c. It takes until 28 January 80 (week 18, FY80) to dissipate the initial pool (370) with the increased work week and the reduced input schedule into Primary. This involves 270 student-years in the pool awaiting entry into Primary. There are a total of 594 student-years in pools somewhere in the system during FY79 alone. This is a substantial reduction from Scenario No. 1; however, it also serves to point up the difficulties involved in dissolving student pools and absorbing superfluous input students.

4.3 Scenario No. 3 - This is Scenario No. 1 with the reduced student input of No. 2. The purpose of the exercise is to determine the number of aircraft required to meet the PTRs of FY80-FY83. Since UHPT is discontinued in FY81, a shortfall in that year is expected; however, the PTR for FY80 should be met.

This type of exercise is one of the most awkward problems for the DSFM to accommodate in its present form. The procedure followed in this instance was to examine the output of Scenario No. 1 to learn where the bottlenecks were. Aircraft inventories were then increased in the bottleneck phases. The incremental increase in aircraft inventories were the

product of close examination of the week-to-week student flows and the location of excess training capacity as presented in the standard output of the DSFM. Then a new solution was produced using the new aircraft inventories. This procedure was iterated until there were no shortfalls in the solution. It required five iterations (six runs of the DSFM counting Scenario No. 1) to acquire the final results summarized in Figure 4.1.

When a suitable DSFM solution has been obtained, there are considerable hand calculations to be made before the data in Figure 4.1 can be determined. Figure 4.2 lists the steps in this process for each phase and type aircraft concerned. Perhaps a specific example would be the best way to explain the entries in Figure 4.2 leading to the summary in Figure 4.1. Keep in mind that the DSFM output is by week number in each fiscal year; therefore, the aggregation by quarter was done manually. (This has since been automated.) The first column for PR-R34C-Whiting under Q3, FY79, Figure 4.2a will be the example.

a. New required capacity (grads): Aggregated over the quarter from the DSFM solution (405).

b. Average phase length (weeks): Same (14)

c. Normalizing factor: The ratio of the annual average phase length to the quarterly average phase length (16/14 = 1.14).

d. Normalized required capacity: This is (a) divided by (c) (405/1.14 = 355). By normalizing, the required capacity is on an annual average which facilitates the computations for the required aircraft to provide the increased capacity.

e. Programmed capacity: Existing capacity as in Scenario No. 1 (270)

f. Required change in capacity: This is (d) minus (e) (355 - 270 = +85).

g. Required change in aircraft: This is (f) converted to aircraft.

AIRCRAFT INVENTORIES

	FY 79 Q1	Q2	Q3	Q4	FY 80 Q1	Q2	Q3	Q4	FY 81 Q1	Q2	Q3	Q4
PK-T34C-Whiting												
Currently programmed			124	126	125	125	126	133	150	151	149	149
Required change			+52	-23	+22	- 8	+36	+ 6	-14	-25	-19	+10
New total			176	103	147	117	162	139	136	126	130	159
IP-T34C-Whiting												
Currently programmed			27	27	27	26	27	28	19	19	19	19
Required change			- 8	+ 8	+11	+ 5	+ 9	- 4	- 1	- 4	- 2	+ 3
New total			19	35	38	31	36	24	18	15	17	22
TOTAL-T34C*			195	138	185	148	198	163	154	141	147	181
Average during FY			167			174				156		
IS-T2C-Corpus Area (Kings&Chase)												
Currently programmed			90	90	90	90	90	90	90	90	90	90
Required change			- 2	0	+ 4	+ 6	0	+40	+16	+ 9	+10	+14
New total			88	90	94	96	90	130	106	99	100	104
IS-T2C-Whiting Area (Merid&Pens)												
Currently programmed			49	49	49	49	49	49	49	49	49	49
Required change			- 8	+ 1	+ 8	+ 6	+ 3	+19	+14	+ 8	+ 5	+ 3
New total			41	50	57	55	52	68	60	57	54	52
TOTAL-T2C			129	140	151	151	142	198	166	156	154	156
Average during FY			135			161				158		

*or equivalent in T28s.

Figure 4.1a

AIRCRAFT INVENTORIES

	FY 79 Q1	FY 79 Q2	FY 79 Q3	FY 79 Q4	FY 80 Q1	FY 80 Q2	FY 80 Q3	FY 80 Q4	FY 81 Q1	FY 81 Q2	FY 81 Q3	FY 81 Q4
AS-TA4-Corpus Area (Kings&Chase)												
Currently programmed			97	97	97	97	97	97	97	97	97	97
Required change			- 1	- 1	+ 5	-19	+ 3	- 1	+10	- 1	+ 5	+ 8
New total			96	96	102	78	100	96	107	96	102	105
AS-TA4-Whiting Area (Merid&Pens)												
Currently programmed			44	44	44	44	44	44	44	44	44	44
Required change			- 1	+ 3	+ 7	+ 4	+11	+ 8	+16	+ 4	+11	+ 5
New total			43	47	51	48	55	52	60	48	55	49
TOTAL-TA4			139	143	153	126	155	148	167	144	157	154
Average during FY			141			146				156		
PH-TH57-Whiting												
Currently programmed			21	27	27	28	28	28				
Required change			+ 1	+13	+18	+15	+16	+ 9				
New total			22	40	45	43	44	37				
Average during FY			31			42						
AH-TH1-Whiting												
Currently programmed			61	61	61	61	61	61	61	61		
Required change			- 7	+25	+26	+17	+28	+30	+13	-17		
New total			54	86	87	78	89	91	74	44		
Average during FY			70			86			59			

Figure 4.1b

ADJUSTED CAPACITIES AND AIRCRAFT INVENTORIES

	FY 79				FY 80				FY 81			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PR-T34C-Whiting												
New required capacity (grads)			405	222	209	208	373	281	222	244	361	274
Average phase length (weeks)			14	17	19	16	14	17	19	16	14	17
Normalizing factor			1.14	.94	.84	1.00	1.14	.94	.84	1.00	1.14	.94
Normalized required capacity			355	236	249	208	327	299	263	244	277	336
Programmed capacity			270	274	210	223	257	287	293	295	316	396
Required change in capacity			+85	-38	+39	-15	+70	+12	-30	-51	-39	+20
Required change in aircraft			+52	-23	+22	- 8	+36	+ 6	-14	-25	-19	+10
Programmed aircraft			124	126	125	125	126	133	150	151	149	149
New total aircraft			176	103	147	117	162	139	136	126	130	159
IP-T34C-Whiting												
New required capacity (grads)			170	234	161	141	289	188	96	102	166	145
Average phase length (weeks)			4	5	6	6	4	5	6	6	4	5
Normalizing factor			1.25	1.00	.83	.83	1.25	1.00	.83	.83	1.25	1.00
Normalized required capacity			136	214	194	170	222	160	116	94	116	145
Programmed capacity			176	176	138	142	169	186	120	119	129	129
Required change in capacity			-40	+38	+56	+28	+53	-26	- 4	-25	-13	+16
Required change in aircraft			- 8	+ 8	+11	+ 5	+ 9	- 4	- 1	- 4	- 2	+ 3
Programmed aircraft			27	27	27	26	27	28	19	19	19	19
New total aircraft			19	35	38	31	36	24	18	15	17	22

Figure 4.2a

ADJUSTED CAPACITIES AND AIRCRAFT INVENTORIES

	FY 79				FY 80				FY 81			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
IS-T2C-Corpus (Kings&Chase)												
New required capacity (grads)			100	76	76	90	103	108	86	92	113	87
Average phase length (weeks)			17	23	22	19	17	23	22	19	17	23
Normalizing factor			1.18	.87	.91	1.05	1.18	.87	.91	1.05	1.18	.87
Normalized required capacity			85	87	84	86	87	124	95	88	96	100
Programmed capacity			87	87	80	80	87	87	80	80	87	87
Required change in capacity			- 2	0	+ 4	+ 6	0	+37	+15	+ 8	+ 9	+13
Required change in aircraft			- 2	0	+ 4	+ 6	0	+40	+16	+ 9	+10	+14
Programmed aircraft			90	90	90	90	90	90	90	90	90	90
New total aircraft			88	90	94	96	90	130	105	99	100	104
IS-T2C-Whiting (Merid&Pens)												
New required capacity (grads)			48	43	46	52	60	57	49	54	63	44
Average phase length (weeks)			17	23	22	19	17	23	22	19	17	23
Normalizing factor			1.18	.87	.91	1.05	1.18	.87	.91	1.05	1.18	.87
Normalized required capacity			41	49	51	50	51	66	54	51	53	51
Programmed capacity			48	48	44	44	48	48	44	44	48	48
Required change in capacity			- 7	+ 1	+ 7	+ 6	+ 3	+18	+10	+ 7	+ 5	+ 3
Required change in aircraft			- 8	+ 1	+ 8	+ 6	+ 3	+19	+11	+ 8	+ 5	+ 3
Programmed aircraft			49	49	49	49	49	49	49	49	49	49
New total aircraft			41	50	57	55	52	68	60	57	54	52

Figure 4.2b

ADJUSTED CAPACITIES AND AIRCRAFT INVENTORIES

	FY 79				FY 80				FY 81			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
AS-TA4-Corpus (Kings&Chase)												
New required capacity (grads)			113	90	85	75	118	90	90	93	120	98
Average phase length (weeks)			16	20	21	18	16	20	21	18	16	20
Normalizing factor			1.13	.90	.86	1.00	1.13	.90	.86	1.00	1.13	.90
Normalized required capacity			100	100	99	75	104	100	104	93	106	109
Programmed capacity			101	101	94	94	101	101	94	94	101	101
Required change in capacity			- 1	- 1	+ 5	-19	+ 3	- 1	+10	- 1	+ 5	+ 8
Required change in aircraft			- 1	- 1	+ 5	-19	+ 3	- 1	+10	- 1	+ 5	+ 8
Programmed aircraft			97	97	97	97	97	97	97	97	97	97
New total aircraft			96	96	102	78	100	96	107	96	102	105
AS-TA4-Whiting (Merid&Pens)												
New required capacity (grads)			51	44	42	49	64	49	50	49	64	46
Average phase length (weeks)			16	20	21	17	15	20	21	17	16	20
Normalizing factor			1.13	.90	.86	1.06	1.13	.90	.86	1.06	1.13	.90
Normalized required capacity			45	49	49	46	57	54	58	46	57	51
Programmed capacity			46	46	42	42	46	46	42	42	46	46
Required change in capacity			- 1	+ 3	+ 7	+ 4	+11	+ 8	+16	+ 4	+11	+ 5
Required change in aircraft			- 1	+ 3	+ 7	+ 4	+11	+ 8	+16	+ 4	+11	+ 5
Programmed aircraft			44	44	44	44	44	44	44	44	44	44
New total aircraft			43	47	51	48	55	52	60	48	55	49

Figure 4.2c

ADJUSTED CAPACITIES AND AIRCRAFT INVENTORIES

	FY 79				FY 80				FY 81			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
PH-TH57-Whiting												
New required capacity (grads)			102	184	113	126	204	172				
Average phase length (weeks)			4	4	7	6	4	4				
Normalizing factor			1.25	1.25	.71	.83	1.25	1.25				
Normalized required capacity			82	147	159	152	163	138				
Programmed capacity			79	101	94	97	105	105				
Required change in capacity			+ 3	+46	+65	+55	+58	+33				
Required change in aircraft			+ 1	+13	+18	+15	+16	+ 9				
Programmed aircraft			21	27	27	28	28	28				
New total aircraft			22	40	45	43	44	37				
AH-TH1-Whiting												
New required capacity (grads)			123	159	121	137	201	168	103	76		
Average phase length (weeks)			9	11	14	11	9	11	14	11		
Normalizing factor			1.22	1.00	.79	1.00	1.22	1.00	.79	1.00		
Normalized required capacity			101	159	153	137	165	168	130	76		
Programmed capacity			114	114	106	106	114	114	106	106		
Required change in capacity			-13	+45	+47	+31	+51	+54	+24	-30		
Required change in aircraft			- 7	+25	+26	+17	+28	+30	+13	-17		
Programmed aircraft			61	61	61	61	61	61	61	61		
New total aircraft			54	86	87	78	89	91	74	44		

Figure 4.2d

This conversion uses the factor from Figure 3.7 "Pipeline Grads per Aircraft per Year" for the T34C for Primary without the Phased Primary syllabus and without the 2B37 trainer (6.58). Since we are interested in only a quarter of a year, the factor becomes 6.58/4 = 1.65. The conversion from capacity to aircraft is then 85/1.65 = 52 aircraft.

h. Programmed aircraft: Existing inventories as in Scenario No. 1 (124)

i. New total aircraft: This is (g) plus (h) (52 + 124 = 176).

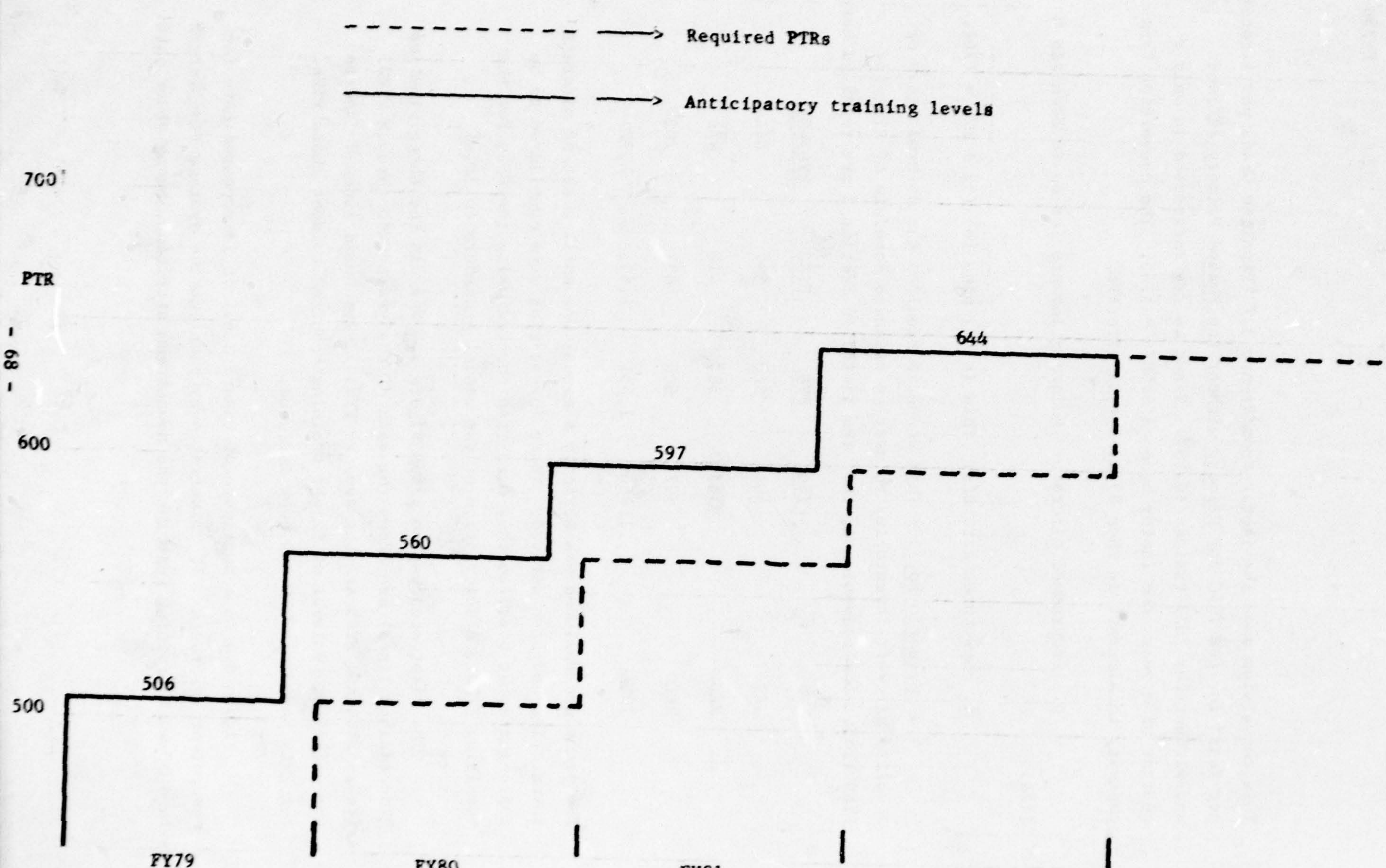
4.4 Scenario No. 4 - This scenario required the determination of required aircraft inventories to meet an expanded schedule of PTRs for FY80-FY85. For convenience, the PTRs listed in Section 2 are repeated here.

	FY80	FY81	FY82	FY83-85
JET	506	560	597	644
PROP	363	383	416	425
HELO	597	608	638	702
TOTAL	1,466	1,551	1,651	1,771

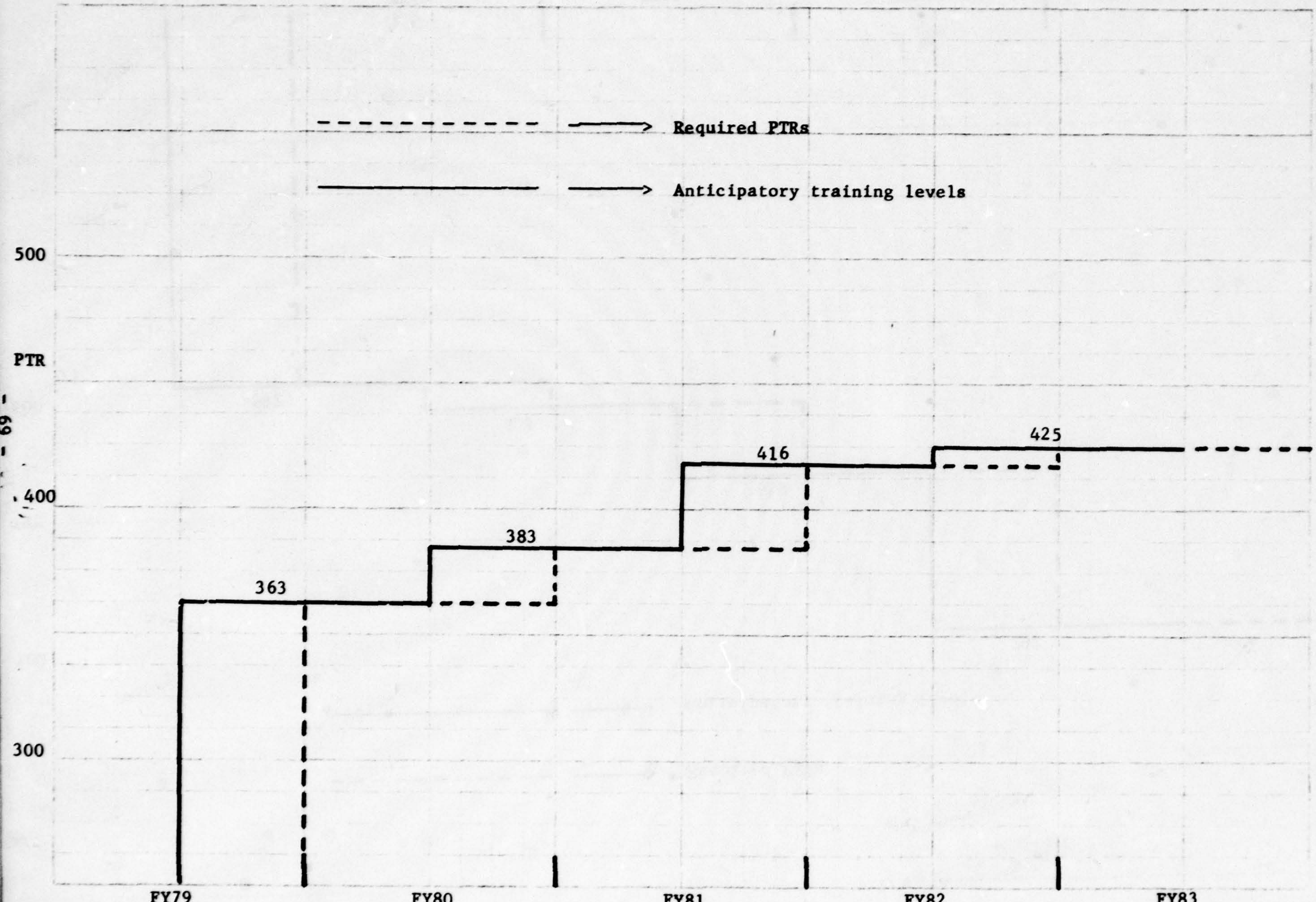
The procedure followed was strictly a manual one until a set of aircraft inventories had been derived. Those inventories were considered to be approximate, at best, so they were then checked using the DSFM for the resulting PTRs. A description of the manual procedure follows.

The first step was to graph Figure 4.3 wherein the three pipeline PTRs (dashed lines) are shown for each of the years FY80 through FY83. (Years FY84 and FY85 are the same as FY83.) The solid lines delineate the anticipatory level of flight training required to meet those PTRs. For this purpose, FY79 has been included.

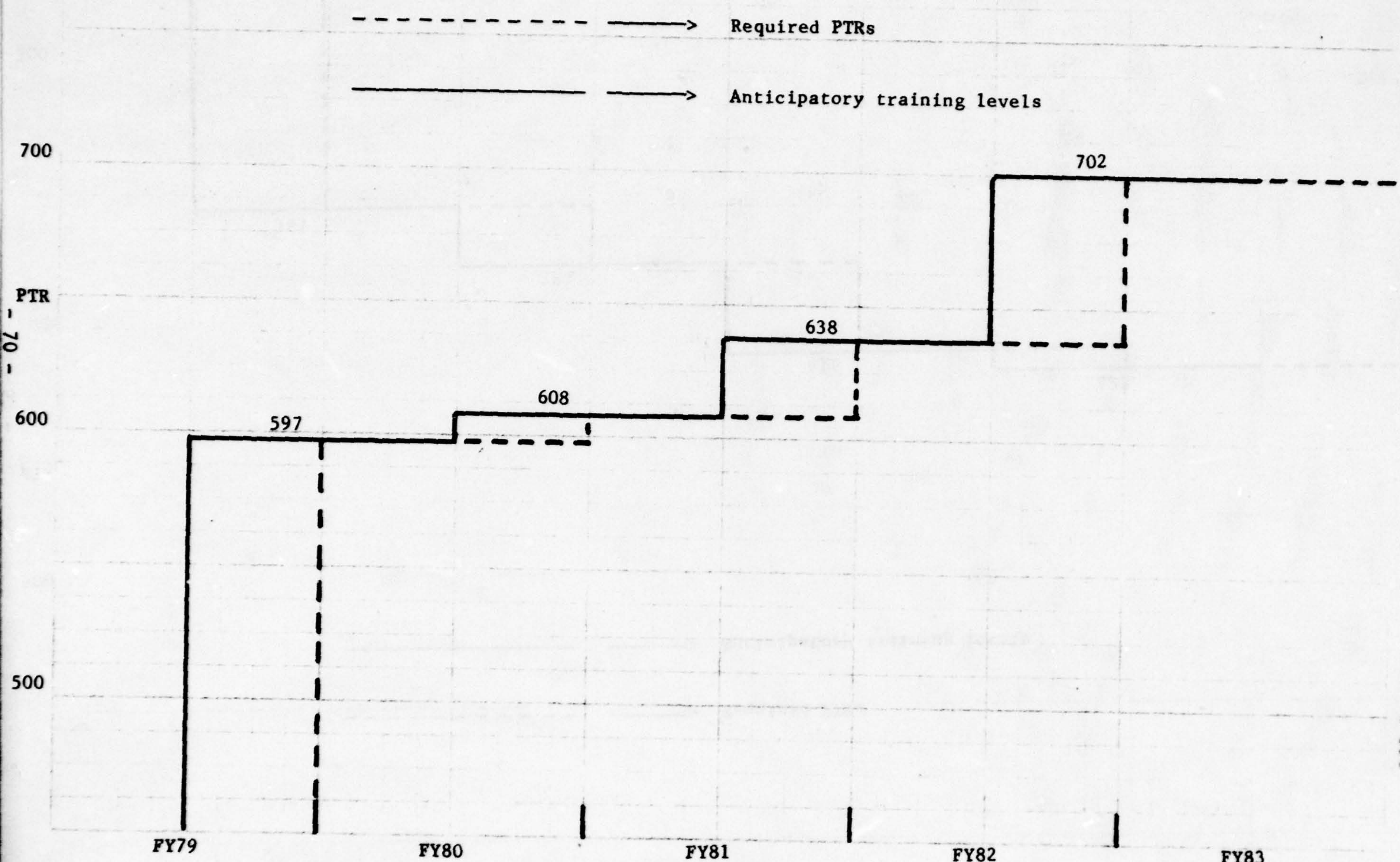
Figure 4.4 is a duplicate of Figure 3.6. It is repeated here for convenient reference. It illustrates by pipeline the average time length in a 50-week training year the the downstream attrition, among other data.



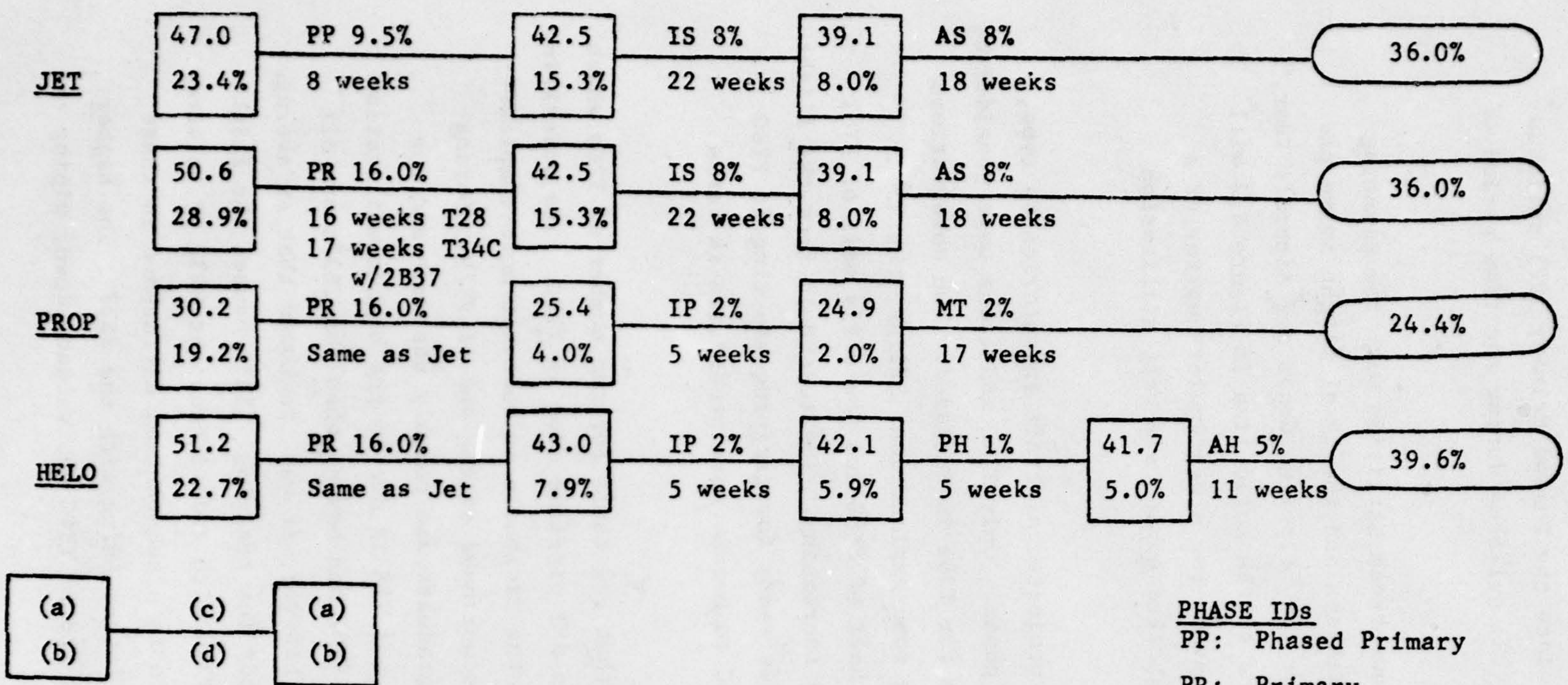
JET TRAINING
Figure 4.3a



PROP TRAINING
Figure 4.3b



HELO TRAINING
Figure 4.3c



(a): This is the number of inputs at this phase level to achieve the right balance for all pipelines in every 100 total graduates.

(b): This is the downstream attrition suffered by the inputs at this phase level.

(c): Phase ID and attrition.

(d): Average phase duration. An average of two weeks is added to all pipeline lengths indicated here to account for transit times between phases and stations.

PHASE IDs

PP: Phased Primary

PR: Primary

IS: Intermediate Strike

AS: Advanced Strike

IP: Intermediate Prop

MT: Maritime

PH: Primary Helo (Rotary)

AH: Advanced Helo (Rotary)

Downstream Attrition

Figure 4.4

Two sequences are shown for JET since the Phased Primary (PP) syllabus will be replaced by the Primary (PR) syllabus during the time period of interest.

Figure 4.5 combines the downstream attrition with the planning factors for annual aircraft utilization and the total flight hours per phase graduate to produce a factor for "Pipeline Grads per Aircraft Year." This factor divided into the value on the solid line in Figure 4.3 will yield the projected aircraft inventory for a particular quarter of a year based on a quarter of the expected annual aircraft utilization (a gross assumption).

Figure 4.6 summarizes the projected aircraft inventories by type, year, and pipeline which share a phase. Only T34C additions were considered, therefore, a table of equivalence for T28s is included. Two observations on the data in Figure 4.6 deserve some explanation. First, the T34C requirement dips during the last half of FY80 and the early half of FY81 although the PTR requirements are increasing. The reason is that the flight trainer for the T34C (2B37) becomes ready for training starting in FY80 (see Figure 3.8) causing each T34C to become more productive in terms of phase graduates.

The second observation is that the table for the number of T28s which are equivalent to one T34C for the JET pipeline dips in FY80. The underlying reason is basically the same, but the rationale is somewhat more complex. The Phased Primary syllabus is discontinued at the end of FY79. During FY79, the flight hours per phase graduate are roughly the same and the 1.27 equivalence between the T34C and T28 is due to the higher utilization of the T34C. The same is true of FY81 and beyond when the 2B37s are all ready for training. During FY80, however, it was reckoned that an average of one-half of the 2B37s were ready for training. This causes the flight hours per phase graduate for the T34C with and without the 2B37 to be used approximately half the time. There is a substantial difference in these hours: 109.5 vis-a-vis 87.0, the latter being with the 2B37. The higher flight time requirement drives the T28 to T34C equivalence down, wiping out

JET PIPELINE

PHASE NAME (ID)	Type Aircraft	Flight Hours per Aircraft per Year	Flight Hours per Phase Grad	Down-stream Attrition	Flight Hours per Pipeline Grad	Pipeline Grads per Aircraft per Year
Phased Primary						
(PP)	T28	622	42.5	15.3	50.2	12.39
	T34C	800	43.1	15.3	50.9	15.72
Primary						
(PR)	T28	622	86.2	15.3	101.8	6.11
	T34C	800	109.5	15.3	129.3	6.19
(with 2B37)	T34C	800	87.0	15.3	102.7	7.79
Int. Strike						
(IS)	T2C	543	134.0	8.0	145.7	3.73
Adv. Strike						
(AS)	TA4	580	144.7	0.0	144.7	4.01

Figure 4.5a

PROP PIPELINE

PHASE NAME (ID)	Type Air-craft	Flight Hours per Aircraft per Year	Flight Hours per Phase Grad	Down-stream Attri-tion	Flight Hours per Pipe-line Grad	Pipe-line Grads per Aircraft per Year
Primary						
(PR)	T28	622	86.2	4.0	89.8	6.93
	T34C	800	109.5	4.0	114.1	7.01
(with 2B37)	T34C	800	87.0	4.0	91.1	8.78
Inter. Prop						
(IP)	T28	622	29.8	2.0	30.4	20.46
	T34C	800	38.4	2.0	39.2	20.41
(with 2B37)	T34C	800	29.9	2.0	30.5	26.23
Maritime						
(MT)	T44A	800	136.0	0.0	136.0	5.88
(with 2F129)	T44A	800	108.3	0.0	108.3	7.39

Figure 4.5b

HELO PIPELINE

PHASE NAME (ID)	Type Air-craft	Flight Hours per Aircraft per Year	Flight Hours per Phase Grad	Down-stream Attri-tion	Flight Hours per Pipe-line Grad	Pipe-line Grads per Aircraft per Year
Primary						
(PR)	T28	622	86.2	7.9	93.6	6.65
	T34C	800	109.5	7.9	118.9	6.73
(with 2B37)	T34C	800	87.0	7.9	95.0	8.42
Inter. Prop						
(IP)	T28	622	29.8	5.9	31.7	19.62
	T34C	800	38.4	5.9	40.8	19.61
(with 2B37)	T34C	800	29.9	5.9	31.8	25.16
Primary RW (PH)	TH57	643	42.1	5.0	44.3	14.51
Advanced RW (AH)	TH1	578	80.5	0.0	80.5	7.18

Figure 4.5c

T34C Equivalents

	FY79				FY80				FY81				FY82				FY83			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Jet	42	42	42	80	80	80	80	77	77	77	77	82	82	82	82	82	82	82	82	82
Prop	-	-	70	70	70	70	59	59	59	59	63	63	63	63	64	64	64	64	64	64
Helo	-	-	119	119	119	119	96	96	96	96	101	101	101	101	111	111	111	111	111	111
Total			231	269	269	269	235	232	232	232	241	246	246	246	257	257	257	257	257	257
T2C	136	136	136	149	149	149	149	159	159	159	159	171	171	171	171	171	171	171	171	171
TA4	126	126	126	138	138	138	138	148	148	148	148	159	159	159	159	159	159	159	159	159
T44A			62	62	62	62	52	52	52	52	56	56	56	56	58	58	58	58	58	58
TH57			41	41	41	41	42	42	42	42	44	44	44	44	48	48	48	48	48	48
TH1			83	83	83	83	85	85	85	85	89	89	89	89	98	98	98	98	98	98

T34C Equivalents:

The following table gives the number of T28s to be equal to one T34C.

During	Jet	Prop	Helo
FY79	1.27	1.01	1.01
FY80	1.14	1.14	1.14
FY81 & on	1.27	1.27	1.27

Figure 4.6

part of the T34C advantage of higher utilization.

A single run was made with the DSFM to verify or dispute the projected aircraft inventories of Figure 4.6 as being suitable for meeting the required PTRs. Figure 4.7 prorates the T34C data of Figure 4.6 among Phased Primary, Primary, and Intermediate Maritime/Helo. Figure 4.8 is a reflection of Figure 4.7 in terms of capacity to train; the form of the inputs for the DSFM.

The results of the DSFM run in terms of pipeline PTRs are the following:

PTRs	FY80	FY81	FY82	FY83	FY84
JET	506	443	597	635	635
PROP	363	383	416	425	425
HELO	592	608	638	702	702
TOTAL	1,461	1,434	1,651	1,762	1,762
Shortfalls					
JET	0	117	0	9	9
PROP	0	0	0	0	0
HELO	5	0	0	0	0

The large shortfall in the JET pipeline in FY81 indicates either or both a shortage in the aircraft inventory or a mismatch in the time phasing of the changes in aircraft inventories. A careful examination of the routine DSFM outputs revealed that it is a shortage in aircraft. An addition of eight T34Cs during the first quarter FY80 and 12 TA4s during the first quarter FY81 would remove 95 of the 117 shortfalls leaving 22 short. To reduce the 22 further would require additional T34Cs, T2Cs and TA4s.

One of the routine outputs of the DSFM is a listing by week, phase, and location of any unused capacity to train. A review of this output

	Type A/C	FY 79 Q1	FY 79 Q2	FY 79 Q3	FY 79 Q4	FY 80 Q1	FY 80 Q2	FY 80 Q3	FY 80 Q4	FY 81 Q1	FY 81 Q2	FY 81 Q3	FY 81 Q4	FY 82 Q1	FY 82 Q2	FY 82 Q3	FY 82 Q4
TOTAL	T34C	231			269			235	232			241	246			257	
Ph.Primary		33			39	0											
Primary		147			171	222		194	191			199	203			211	
Intermed.		51			59	47		41	41			42	43			46	
Int.Strike	T2C	136			149				159				171				
Adv.Strike	TA4	126			138				148				159				
Maritime	T44A	62						52				56				58	
Pri.Helo	TH57	41						42				44				48	
Adv.Helo	TH1	83						85				89				98	

Figure 4-7: Aircraft Inventories

	Type A/C	FY 79 Q1	FY 79 Q2	FY 79 Q3	FY 79 Q4	FY 80 Q1	FY 80 Q2	FY 80 Q3	FY 80 Q4	FY 81 Q1	FY 81 Q2	FY 81 Q3	FY 81 Q4	FY 82 Q1	FY 82 Q2	FY 82 Q3	FY 82 Q4
Ph.Primary	T34C	10.4			12.3	0											
Primary	T34C	20.1			23.4	31.1	33.0	30.5	31.6			33.0	33.6			34.9	
Intermed.	T34C	20.3			23.5	20.0	21.4	19.8	21.0			21.5	22.0			23.5	
Int.Strike	T2C	10.1			11.1				11.9				12.9				
Adv.Strike	TA4	10.1			11.1				11.9				12.9				
Maritime	T44A	9.2						7.7				8.3				8.6	
Pri.Helo	TH57	11.9						12.2				12.8				13.9	
Adv.Helo	TH1	11.9						12.2				12.8				14.1	

Figure 4-8: Weekly Capacities

Note: Blank entries on a line indicates a repeat of the last value entered on the left.

disclosed that, for the given output, the inventories in Figure 4.6 would constitute a well-balanced system in terms of aircraft availability. The significant point in this context is that the DSFM can provide a quantitative check on flight training projections obtained by any other means. In this instance, all shortfalls could be eliminated through an iterative process using the DSFM to check corrective estimates.

4.5 Scenario No. 5 - This scenario was designed for the production of new student input schedules with reduced programmed student inputs for FY79 and reduced attrition for FY80. The new input schedules were for the period 12 March 79 (week 24, FY79) through FY80.

a. The PTR results of the DSFM for this scenario were the following.

Projected PTRs	FY79	FY80	FY81
JET	570	506	552
PROP	342	363	369
HELO	574	597	655
TOTAL	1,486	1,466	1,576
DSFM PTRs			
JET	437	506	513
PROP	342	363	369
HELO	369	405	407
TOTAL	1,075	1,274	1,289
Shortfalls			
JET	133	0	39
PROP	0	0	0
HELO	278	192	248
TOTAL	311	192	287

b. Figure 4.9 lists the proposed student input schedule for FY79, week 24 and beyond. Downstream attrition was based on the current planning factors for phase attritions.

c. Figure 4.10 tabulates the proposed student inputs for FY80 using no attrition for the first quarter of FY80 and 17.6 percent thereafter. Inputs are divided into two groups: "AOC & AVROC" who go through a 12-week ground school with a 10 percent attrition before entering Primary flight training and "All Officers" who have a four-week preparatory ground school with a 2 percent attrition. A further breakdown of student categories is not appropriate without more information of the kind that was available for Figure 4.9.

d. Figure 4.11 is similar to Figure 4.10 except that the downstream attrition was based on current planning factors. This result was not called for in the scenario, but is presented here for comparison with Figure 4.10.

4.6 Scenario No. 6 - The scenario sets a requirement for six separate runs on the DSFM. Briefly:

Scenario No. 6a contained a partially prescribed student input schedule for FY80 (see Figure 3.25).

Scenario No. 6b required the DSFM to compute an optimum input schedule for student inputs for FY80.

Scenario No. 6c was the same as 6a except that the total capacity to train in the Primary phases was increased to 42 per week for the remainder of FY79.

Scenario No. 6d was the same as 6b except the expanded capacity of 6c was used.

The student input schedule for FY79 as produced in Scenario No. 5 (see Figure 4.9) was used in all the Scenario 6 runs.

FY79 Recommended Student Inputs into NASC

Date	Week No.	AOC	AVROC	Navy	USMC	USCG	Foreign
3/12/79	24	15	0	2	12	4	0
19	25	0	10	2	12	0	0
26	26	15	0	2	12	0	0
4/02/79	27	0	10	2	12	0	0
09	28	10	0	2	12	0	0
16	29	0	10	2	10	3	0
23	30	10	0	2	10	0	0
30	31	0	10	2	9	0	0
5/07/79	32	10	0	2	9	0	0
14	33	0	5	2	9	0	0
21	34	10	0	2	9	0	0
28	35	0	0	2	9	0	0
6/04/79	36	10	0	6	9	0	0
11	37	0	0	6	9	0	0
18	38	10	0	6	9	3	0
25	39	0	0	6	9	0	0
7/02/79	40	10	0	6	9	0	0
09	41	0	0	6	9	6	0
16	42	10	0	6	9	0	0
23	43	0	0	6	9	0	0
30	44	10	0	6	9	0	0
8/06/79	45	0	0	6	9	0	0
13	46	15	0	6	9	0	0
20	47	0	0	6	9	3	0
27	48	15	0	10	9	0	0
9/03/79	49	0	0	10	9	6	0
10	50	20	0	10	9	0	0
17	51	0	0	10	9	0	0
24	52	10	0	10	9	6	0
Totals		180	45	146	278	31	0

Figure 4.9

FY80 NASC INPUT SKED
(No Downstream Attrition 1st Quarter,
17.6% Thereafter)

Date	Week No.	AOC & AVROC	All Officers	Total	Date	Week No.	AOC & AVROC	All Officers	Total
10/1/79	1	0	0	0	4/7/80	28	7	33	40
	2	0	0	0		29	7	33	40
	3	0	0	0		30	7	21	28
	4	0	0	0		31	7	21	28
	5	5	0	5	5/5/80	32	7	21	28
11/5/79	6	6	0	6		33	6	21	27
	7	7	0	7		34	5	21	26
	8	7	0	7		35	5	21	26
	9	8	0	8	6/2/80	36	4	21	25
12/3/79	10	8	0	8		37	4	22	26
	11	8	0	8		38	4	22	26
	12	8	0	8		39	3	22	25
						40	3	22	25
1/7/80	15	9	16	25	7/7/80	41	4	22	26
	16	9	17	26		42	4	22	26
	17	9	25	34		43	4	22	26
	18	9	25	34		44	4	18	22
2/4/80	19	9	27	36	8/4/80	45	4	18	22
	20	9	27	36		46	4	18	22
	21	9	30	39		47	5	18	23
	22	8	30	38		48	5	18	23
3/3/80	23	7	32	39	9/2/80	49	5	22	27
	24	7	33	40		50	5	22	27
	25	7	34	41		51	5	22	27
	26	7	34	41		52	5	22	27
	27	7	33	40					
						Total	285	908	1,193

Figure 4.10

FY80 RECOMMENDED NASC INPUT SKED
(Planning Factor Downstream Attrition)

Date	Week No.	AOC & AVROC	All Officers	Total	Date	Week No.	AOC & AVROC	All Officers	Total
10/1/79	1	0	0	0	4/7/80	28	8	37	45
	2	0	0	0		29	8	37	45
	3	0	0	0		30	7	24	31
	4	0	0	0		31	7	24	31
	5	6	0	6	5/5/80	32	7	24	31
11/5/79	6	6	0	6		33	6	24	30
	7	8	0	8		34	6	24	30
	8	8	0	8		35	6	24	30
	9	9	0	9	6/2/80	36	4	24	28
12/3/79	10	9	0	9		37	4	25	29
	11	9	0	9		38	4	25	29
	12	9	0	9		39	4	25	29
1/7/80	15	10	19	29		40	4	24	28
	16	10	20	30	7/7/80	41	5	24	29
	17	10	28	38		42	5	24	29
	18	10	28	38		43	5	24	29
2/4/80	19	10	30	40		44	5	20	25
	20	10	30	40	8/4/80	45	5	20	25
	21	10	34	44		46	5	20	25
	22	8	34	42		47	6	20	26
3/3/80	23	8	36	44		48	6	25	31
	24	8	36	44	9/2/80	49	6	25	31
	25	8	37	45		50	6	25	31
	26	8	37	45		51	6	25	31
	27	8	37	45		52	6	25	31
						Total	323	1,019	1,342

Figure 4.11

a. <u>The results for 6a</u> - The student input schedule into NASC is listed in Figure 4.12. The drawdown during FY80 on the student pool awaiting Primary is tabulated in Figure 4.13. The net drawdown is only 81 from an initial pool of 560 leaving 479 at the end of FY80.

b. <u>The results of 6b</u> - The student input schedule for drawing the pool down as quickly as possible during FY80 is shown in Figure 4.14. The rate at which this drawdown occurs is tabulated in Figure 4.13 along with the 6a rate.

c. <u>The results of 6c</u> - The student input schedule into NASC is the same as for 6a in Figure 4.12. The drawdown during FY80 on the student pool awaiting Primary is tabulated in Figure 4.15. The net drawdown is only 73 from an initial pool of 377 leaving 304 at the end of FY80.

d. <u>The results of 6d</u> - The student input schedule for drawing the pool down as quickly as possible during FY80 is shown in Figure 4.16. The rate at which this drawdown occurs is tabulated in Figure 4.15 along with the 6c rate.

The annual productivity in terms of maximum PTRs was the same for each of the Scenario No. 6 DSFM runs. This indicates that the bottlenecks in the system are not in the number of students scheduled as inputs or in the capacity to train in the Primary phases. Earlier, it was disclosed that the bottlenecks were in the Intermediate Strike, Maritime, and Primary Helo phases. The following is a summary of the required PTRs and the resulting shortfalls.

PTR	FY79	FY80	FY81
JET	570	506	552
PROP	342	363	369
HELO	574	597	655
TOTAL	1,486	1,466	1,576

Student Input Schedule to NASC
Scenario No. 6a Conditions*

FY80 Date	Week No.	AOC	AVROC	Officers Navy	USMC	USCG	Foreign
10/1/79	1	10	0	18	10	2	0
9	2	0	5	18	10	0	0
15	3	10	0	18	10	2	0
22	4	0	5	18	10	0	0
29	5	10	0	19	10	2	0
11/5/79	6	0	5	19	10	0	0
13	7	10	0	19	10	2	0
19	8	0	5	18	10	0	0
26	9	10	0	19	10	2	0
12/3/79	10	0	5	19	10	0	0
10	11	10	0	19	11	2	0
17	12	0	5	18	11	0	0
1/14/80	16	10	0	18	11	2	0
21	7	0	5	18	11	0	0
28	8	10	0	18	11	2	0
2/4/80	9	0	5	18	11	0	0
11	20	15	5	15	11	3	0
19	1	0	5	15	11	0	0
25	2	15	0	15	11	3	0
3/3/80	3	0	5	15	11	0	0
10	4	15	0	15	11	3	0
17	5	0	5	15	11	0	0
24	6	15	0	15	11	3	0
31	7	0	5	15	11	0	0
4/7/80	8	10	0	15	11	3	0
14	9	0	5	5	10	0	0
21	30	10	0	5	10	3	0
28	1	0	5	5	10	0	0
5/5/80	2	10	0	5	10	3	0
12	3	0	5	5	10	0	0
19	4	10	0	5	10	2	0
27	5	0	5	10	10	0	0
6/2/80	6	10	0	10	10	2	0
9	37	0	5	15	10	0	0
16	8	10	0	15	10	2	0
23	9	0	5	15	10	0	0
30	40	10	0	10	10	2	0
7/7/80	1	0	5	10	10	0	0
14	2	10	0	15	10	2	0
21	3	0	5	15	10	0	0
28	4	10	0	15	10	2	0

Figure 4.12a

FY80 Date	Week No.	AOC	AVROC	Officers Navy	USMC	USCG	Foreign
8/4/80	5	0	5	15	10	0	0
11	6	10	0	15	10	2	0
18	7	0	5	10	10	0	0
25	8	10	0	10	10	2	0
9/2/80	9	0	5	10	10	0	0
8	50	10	0	10	10	2	0
15	1	0	5	11	10	0	0
22	2	10	0	15	10	2	0
29	01	0	5	15	10	0	0

*Weekly schedule of 700 Navy and 515 USMC officers as given in Figure . The following are given by the total number that must be scheduled into NASC during FY80.

AOC: 270
AVROC: 130
USCG: 57

Use 17.6% downstream attrition from entry into NASC.

Figure 4.12b

FY80 PRIMARY INPUT SKED for Scenarios Nos. 6a & 6b

Date	Week No.	6a Sked Stud Inputs	6a DSFM Primary Entries	6a Pool Size*	6b DSFM Stud Inputs	6b DSFM Primary Entries	6b Pool Size*
10/1/79	1	25	28	557	25	28	557
9	2	42	25	574	42	25	574
15	3	24	27	571	24	27	571
22	4	32	25	578	32	25	578
29	5	30	26	582	0	26	552
11/5/79	6	31	27	586	4	27	529
13	7	30	27	589	0	27	502
19	8	32	27	594	5	28	479
26	9	31	27	598	0	28	451
12/3/79	10	33	25	606	5	26	430
10	11	31	27	610	0	29	401
17	12	31	28	613	4	28	377
1/14/80	15	10	30	593	0	31	446
21	6	36	29	600	0	31	415
28	7	37	32	605	0	30	285
2/4/80	8	37	31	611	0	33	252
11	9	37	32	616	0	34	218
19	20	36	32	620	0	32	186
25	1	38	34	624	0	34	152
3/3/80	2	35	36	623	0	35	117
10	3	37	34	626	0	35	82
17	4	33	35	624	2	20	64
24	5	34	36	622	9	22	51
31	6	34	38	618	0	12	39
4/7/80	7	25	41	602	27	41	25
14	8	39	40	601	0	11	14
21	9	29	41	589	13	13	14
28	30	38	43	584	5	4	15
5/5/80	1	30	43	571	11	9	17
12	2	48	42	577	20	20	17
19	3	20	42	555	21	21	17
27	4	31	42	544	0	0	17
6/2/80	5	19	40	523	11	11	17
9	36	32	43	512	12	12	17
16	7	21	42	491	42	43	16
23	8	30	41	480	41	40	17
30	9	25	43	462	43	42	18

Figure 4.13a

Date	Week No.	6a Sked Stud. Inputs	6a DSFM Primary Entries	6a Pool Size*	6b DSFM Stud. Inputs	6b DSFM Primary Entries	6b Pool Size*
7/7/80	40	31	44	449	43	44	17
14	1	28	41	436	42	43	16
21	2	37	42	431	43	43	16
28	3	29	41	419	41	42	15
8/4/80	4	31	42	408	41	42	14
11	5	25	40	393	40	40	14
18	6	35	37	391	38	37	15
25	7	29	37	383	36	37	14
9/2/80	8	36	11	408	33	34	13
8	9	30	9	429	30	31	12
15	50	36	1	464	30	30	12
22	1	24	13	475	29	29	12
29	2	31	27	479	28	28	12
		1565	1638	+81	847	1137	
				560			

*Pool size at start of FY80 is 560.

Figure 4.13b

FY80 RECOMMENDED NASC INPUT SKED
Scenario No. 6b - 17.6% Downstream Attrition
DSFM Input Solution for FY80

Date	Week No.	AOC & AVROC	All Officers	Total	Date	Week No.	AOC & AVROC	All Officers	Total
10/1/79	1	0	0	0	4/7/80	28	11	16	27
	2	0	0	0		29	11	16	27
	3	0	0	0		30	11	0	11
	4	0	0	0		31	11	8	19
	5	0	0	0	5/5/80	32	11	9	20
11/5/79	6	0	0	0		33	11	32	43
	7	0	0	0		34	10	32	42
	8	0	0	0		35	10	33	43
	9	2	0	2	6/2/80	36	9	34	43
12/3/79	10	3	0	3		37	8	32	40
	11	0	0	0		38	8	34	42
	12	7	0	7		39	7	31	38
						40	7	32	39
1/7/80	15	0	0	0	7/7/80	41	7	30	37
	16	0	0	0		42	7	29	36
	17	3	0	3		43	7	27	34
	18	2	0	2		44	7	25	32
2/4/80	19	3	0	3	8/4/80	45	7	22	29
	20	5	0	5		46	7	23	30
	21	5	7	12		47	7	22	29
	22	0	0	0		48	7	22	29
3/3/80	23	3	20	23	9/2/80	49	7	25	32
	24	3	0	3		50	7	25	32
	25	11	10	21		51	7	25	32
	26	11	4	15		52	7	25	32
	27	11	8	19					
						Total	278	658	936

Figure 4.14

FY80 PRIMARY INPUT SKED
for Scenarios Nos. 6c & 6d

Date	Week No.	6c Sked Stud Inputs	6c DSFM Primary Entries	6c Pool Size*	6d DSFM Stud Inputs	6d DSFM Primary Entries	6d Pool Size#
10/1/79	1	25	28	374	25	28	287
9	2	42	25	391	42	25	804
15	3	24	27	388	24	27	301
22	4	32	25	395	32	25	308
29	5	30	26	399	0	26	382
11/5/79	6	31	27	403	4	27	259
13	7	30	27	406	0	27	232
19	8	32	27	411	5	28	209
26	9	31	27	415	0	28	181
12/3/79	10	33	25	423	5	26	160
10	11	31	27	427	0	29	131
17	12	31	28	430	4	28	107
1/14/80	15	10	30	410	0	31	76
21	6	36	29	417	0	31	45
28	7	37	32	422	0	30	15
2/4/80	8	37	31	428	0	15	0
11	9	37	32	433	0	0	
19	20	36	32	437	0	0	
25	1	38	34	441	0	0	
3/3/80	2	35	35	441	6	6	
10	3	37	35	443	0	0	
17	4	33	35	441	5	5	
24	5	34	36	439	5	5	
31	6	34	37	436	0	0	
4/7/80	7	25	42	419	27	27	
14	8	39	39	419	0	0	
21	9	29	40	408	13	13	
28	30	38	43	403	5	5	
5/5/80	1	30	43	390	11	11	
12	2	48	43	395	22	22	
19	3	20	41	374	20	20	
27	4	31	43	362	0	0	
6/2/80	5	19	41	340	11	11	
9	36	32	42	330	19	19	
16	7	21	42	309	42	42	
23	8	30	40	299	41	41	
30	9	25	44	280	43	43	

Figure 4.15a

FY80 PRIMARY INPUT SKED
for Scenarios Nos. 6c & 6d (Cont'd)

Date	Week No.	6c Sked Stud Inputs	6c DSFM Primary Entries	6c Pool Size*	6d DSFM Stud Inputs	6d DSFM Primary Entries	6d Pool Size#
7/7/80	40	31	42	269	43	43	
14	1	28	42	255	42	42	
21	2	37	45	247	43	43	
28	3	29	41	235	41	41	
8/4/80	4	31	41	225	41	41	
11	5	25	41	209	40	40	
18	6	35	38	206	38	38	
25	7	29	37	198	36	36	
9/2/80	8	36	11	223	33	33	
8	9	30	8	245	30	30	
15	50	36	3	278	30	30	
22	1	24	9	293	29	29	
29	2	31	20	304	28	28	
		1,565	1,638	+73	847	1,137	
				377			

Figure 4.15b

*Pool size at start of FY80 is 377.

#Pool size at start of FY80 is 290.

FY80 RECOMMENDED NASC INPUT SKED

Scenario No. 6d - 17.6% Downstream Attrition

DSFM Input Solution for FY80

Date	Week No.	AOC & AVROC	All Officers	Total
10/1/79	1	0	0	0
	2	0	0	0
	3	0	0	0
	4	0	0	0
	5	0	0	0
11/5/79	6	0	0	0
	7	2	0	2
	8	0	0	0
	9	2	0	2
12/3/79	10	3	0	3
	11	0	0	0
	12	7	0	7
1/7/80	15	0	0	0
	16	0	0	0
	17	3	0	3
	18	2	5	7
2/4/80	19	3	0	3
	20	5	4	9
	21	5	3	8
	22	0	0	0
3/3/80	23	4	20	24
	24	6	0	6
	25	10	10	20
	26	11	5	16
	27	11	8	19

Date	Week No.	AOC & AVROC	All Officers	Total
4/7/80	28	12	16	28
	29	10	16	26
	30	12	0	18
	31	10	8	18
5/5/80	32	11	15	16
	33	10	32	42
	34	11	32	43
	35	9	32	41
6/2/80	36	8	33	41
	37	8	32	40
	38	8	33	41
	39	8	31	39
	40	7	32	39
7/7/80	41	7	30	37
	42	7	29	36
	43	7	27	34
	44	7	26	33
8/4/80	45	7	23	30
	46	7	23	30
	47	7	22	29
	48	7	22	29
9/2/80	49	7	25	32
	50	7	25	32
	51	7	25	32
	52	7	25	32
	Total	282	669	951

Figure 4.16

Shortfall	FY79	FY80	FY81
JET	150	0	0
PROP	84	25	0
HELO	238	154	191
TOTAL	472	179	191

5. Outputs

The routine outputs currently from the DSFM have been designed to respond to a broad spectrum of informational requirements from command, staff, management, and operational levels. In total, the output is quite voluminious but, in general, the higher the echelon, the more the information is aggregated. A brief description follows of some examples of these outputs.

5.1 Figure 5.1 - Executive Summary - Lists actual graduates, PTRs, and shortfalls summarized by pipeline and year. Totals by year are also given for the student inputs to NASC (forthcoming year) and student-weeks in pools. The annual average-on-board within the UPT system is listed for each of the three years. Here, as elsewhere, the subdivision under JET of CORPUS and WHITING means Kingsville and Chase for CORPUS and Meridian and Pensacola for WHITING.

5.2 Figure 5.2 - Staff Summary - Consists of four pages; one for each of the following topics: Student-Weeks in Pools, Student Inputs, Graduates, and Average-On-Board Student Load. Each page is organized by phases as they relate to the topic. Here again, CORPUS means Kingsville and Chase and WHITING means Meridian and Pensacola whenever related to JET or STRIKE.

5.3 Figure 5.3 - Analyst Report - This is one page of a rather long listing that is optional for the detailed use of the analyst whenever essential to his investigations. The example is from the section devoted to weekly student outputs by phase and location over a three-year period. The weekly outputs are aggregated by quarter also. There are parallel

03/14/79 PATHFINDER 112119
DYNAMIC STUDENT FLOW MODEL

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	437	506	540
CORPUS	280	323	345
WHITING	157	183	195
PROP	330	363	369
HELO	296	597	212
TOTAL	1063	1466	1121
PTRS			
JET	570	506	542
PROP	330	363	369
HELO	574	597	590
TOTAL	1474	1466	1501
SHORTFALLS			
JET	133	0	2
PROP	0	0	0
HELO	278	0	378
TOTAL	411	0	380
INPUTS TO NASC			
CNATRA AOB	1295	1246	1047
STUDENT WEEKS IN POOLS	27865	13226	1528

Scenario No. 3

Figure 5.1

AD-A073 834 GEORGE WASHINGTON UNIV WASHINGTON D C PROGRAM IN LOG--ETC F/G 5/9
AN EXERCISE OF THE DYNAMIC STUDENT FLOW MODEL,(U)
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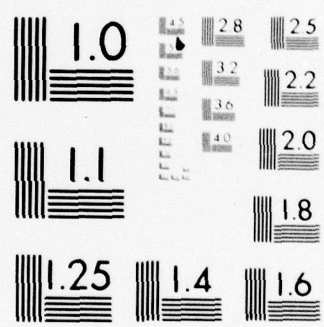
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PATHFINDER

03/14/79 DYNAMIC STUDENT FLOW MODEL 112119

STAFF SUMMARY

STUDENT-WEEKS IN POOLS		1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY		11626	1508	0
OUT OF PRIMARY	@ CORPUS	1757	1651	0
	@ WHITING	6576	6274	477
TOTAL OUT OF PRIMARY		8333	7925	477
OUT OF INTERMEDIATE PROP	@ CORPUS	1281	884	174
	@ WHITING	20	35	0
TOTAL OUT OF INTERMEDIATE PROP		1301	919	174
INTO INTERMEDIATE STRIKE	@ CORPUS	4730	1021	0
	@ WHITING	818	312	0
TOTAL INTO INTERMEDIATE STRIKE		5548	1333	C
INTO ADVANCED STRIKE	@ CORPUS	278	217	418
	@ WHITING	571	637	217
TOTAL INTO ADVANCED STRIKE		849	854	635
INTO ADVANCED HELO		208	687	242
GRAND TOTAL FOR CNATRA		27865	13226	1528

Figure 5.2a

03/14/79 PATHFINDER DYNAMIC STUDENT FLOW MODEL 112119

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	244	0	0
WHITING	187	0	0
CORPUS	57	0	0
PRIMARY	1581	1465	1254
WHITING	1272	1229	1254
CORPUS	309	236	0
INTERMEDIATE PROP	823	995	398
WHITING	599	705	398
CORPUS	224	290	0
INTERMEDIATE STRIKE	607	608	671
WHITING	215	222	231
CORPUS	392	386	440
ADVANCED STRIKE	556	530	616
WHITING	199	201	210
CORPUS	357	329	406
MARITIME	323	380	383
PRIMARY RW - WHITING	422	655	0
ADVANCED RW - WHITING	401	632	88

Figure 5.2b

03/14/79 PATHFINDER DYNAMIC STUDENT FLOW MODEL 112119

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	324	0	C
WHITING	247	0	0
CORPUS	77	0	0
PRIMARY	1519	1155	1059
WHITING	1203	900	1059
CORPUS	316	255	0
INTERMEDIATE PROP	746	1037	391
WHITING	538	740	386
CORPUS	208	297	5
INTERMEDIATE STRIKE	583	487	661
WHITING	208	178	233
CORPUS	375	309	428
ADVANCED STRIKE	437	506	540
WHITING	157	183	195
CORPUS	280	323	345
MARITIME	330	363	369
PRIMARY RW - WHITING	408	663	50
ADVANCED RW - WHITING	296	597	212

Figure 5.2c

PATHFINDER

03/14/79 DYNAMIC STUDENT FLOW MODEL 112119

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	53	0	C
WHITING	40	0	0
CORPUS	12	0	0
PRIMARY	513	404	371
WHITING	411	321	371
CORPUS	102	83	0
INTERMEDIATE PROP	78	102	39
WHITING	56	72	39
CORPUS	21	30	0
INTERMEDIATE STRIKE	240	219	266
WHITING	85	81	93
CORPUS	154	138	173
ADVANCED STRIKE	179	192	201
WHITING	63	70	71
CORPUS	115	121	129
MARITIME	111	127	128
PRIMARY RW - WHITING	40	65	1
ADVANCED RW - WHITING	77	135	37

Figure 5.2d

02/04/79 PATHFINDER 003507

DYNAMIC STUDENT FLOW MODEL

ANALYST REPORT

WEEKLY STUDENT OUTPUT		1979	1980	1981
PRIMARY - WHITING		1203	900	1059
	FQ1	222	228	254
	FW01	0	32	32
	FW02	21	0	0
	FW03	21	30	26
	FW04	20	30	30
	FW05	20	28	30
	FW06	20	25	30
	FW07	20	21	30
	FW08	20	0	0
	FW09	20	23	24
	FW10	20	25	25
	FW11	20	0	0
	FW12	20	14	27
	FQ2	207	79	200
	FW15	20	0	0
	FW16	20	0	22
	FW17	20	0	23
	FW18	20	0	22
	FW19	20	0	0
	FW20	20	0	21
	FW21	20	0	21
	FW22	17	20	23
	FW23	17	20	23
	FW24	17	20	23
	FW25	0	0	0
	FW26	16	19	22
	FQ3	366	280	321
	FW27	16	19	22
	FW28	17	19	22
	FW29	34	39	27
	FW30	17	20	23
	FW31	35	41	26
	FW32	37	27	25
	FW33	18	17	25
	FW34	40	18	25
	FW35	21	17	24
	FW36	42	16	25
	FW37	21	16	27
	FW38	45	15	28
	FW39	23	16	22

Figure 5.3

sections for Student Inputs, Student-on-Board Loads, Training Capacities, Unused Training Capacity, and Student-Weeks in Pools.

5.4 <u>Figure 5.4</u> - Student In/Out Schedule - The example is for the Maritime (MT) phase of training. It shows, week-by-week over five years, the number of students entering and leaving the phase and the resulting on board student load. One significant distinction here from the previously described outputs is that the student numbers are all in pipeline graduates, i.e., all downstream attrition has been washed out. The large number (126) entering the phase on the first week includes the existing on board load.

5.5 <u>Figure 5.5</u> - Student Holdover - A student 'holdover' is one student-week in a pool. This listing is rather self-explanatory except for the columns headed by the cryptic H"   ". These columns contain the holdovers for one of the transit linkages from Primary to Jet. This anomaly will be corrected in future outputs. As in Figure 5.3, all student numbers are in pipeline graduates.

5.6 <u>Figure 5.6</u> - Capacity/Flow Table - This example is from a listing that is used mainly to verify the input capacities to train. The headings FROM and TO are coded node numbers representing starting a phase and completing a phase. The alpha part indicates the phase name and location and the numerical part is the week number of the fiscal year in which the event occurs. For example, A34 (FROM) and Y38 (TO) indicate a phase that started at the beginning of Week 34 and completed at the end of Week 37, an elapsed time of four weeks. (The FROM and TO are used for purposes other than phases but for this exposition, they are of little interest.) Similarly, the NEXT-FROM and NEXT-TO are for internal coding purposes. The next group of interest is under CIJ. In the five columns are the assigned weekly capacities to train for each of five years. The parallel listing under XIJ contains the solution flows of students through the system. The column TIJ lists the phase length in weeks for a student entering the phase indicated by the week number of the FROM node in the furthermost left-hand column. The columns PHASE and INDEX are of GWU interest only. All student numbers are in pipeline graduates. Internally, the DSFM calculates all student flows on a

PROGRAM IN LOGISTICS
INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING
THE GEORGE WASHINGTON UNIVERSITY

TRANS RUN 6 WEEKLY SCHEDULE FOR NT 02/25/79

WEEK	|< 1979 IN	OUT	->| LOAD	|< 1980 IN	OUT	->| LOAD	|< 1981 IN	OUT	->| LOAD	|< 1982 IN	OUT	->| LOAD	|< 1983 IN	OUT	->| LOAD
01	126	7	126	7	8	105	7	9	112	7	9	112	7	9	112
02	4	7	123	7	0	104	7	0	110	7	0	110	7	0	110
03	4	7	120	7	8	111	7	9	117	7	9	117	7	9	117
04	4	7	117	7	8	110	7	9	115	7	9	115	7	9	115
05	4	7	114	7	8	109	7	9	113	7	9	113	7	9	113
06	4	7	111	7	8	108	7	9	111	7	9	111	7	9	111
07	4	7	108	7	0	107	7	0	109	7	0	109	7	0	109
08	4	7	105	7	8	114	7	8	116	7	8	116	7	8	116
09	4	6	102	7	0	113	7	0	115	7	0	115	7	0	115
10	4	6	100	7	7	120	7	8	122	7	8	122	7	8	122
11	4	6	98	7	7	120	7	8	121	7	8	121	7	8	121
12	5	6	97	7	0	120	7	0	120	7	0	120	7	0	120
15	6	6	97	8	6	128	8	6	128	8	6	128	3	6	123
16	6	6	97	8	6	130	8	6	130	8	6	130	8	6	125
17	6	6	97	8	0	132	8	0	132	8	0	132	8	0	127
18	6	6	97	8	6	140	8	6	140	8	6	140	8	6	135
19	6	6	97	8	6	142	8	6	142	8	6	142	8	6	137
20	6	6	97	9	6	145	9	6	145	9	6	145	8	6	139
21	6	6	97	9	6	148	8	6	147	9	6	148	8	6	141
22	6	4	97	9	7	151	9	7	150	9	7	151	9	7	144
23	6	4	99	9	7	153	9	7	152	9	7	153	9	7	146
24	7	4	102	9	7	155	9	7	154	9	7	155	9	7	148
25	7	4	105	9	7	157	9	7	156	9	7	157	9	7	150
26	7	4	108	9	7	159	0	7	149	9	7	159	9	7	152
27	8	4	112	9	7	161	0	7	142	0	7	152	9	7	154
28	8	4	116	9	7	163	7	7	142	9	7	154	9	7	156
29	8	8	120	9	14	165	7	14	142	9	14	156	2	14	151
30	8	4	120	9	7	160	9	7	137	9	7	151	9	7	146
31	8	9	124	9	14	162	0	14	130	4	14	148	9	14	148
32	8	12	123	10	16	158	10	16	126	10	16	144	10	11	144
33	8	6	119	9	8	151	9	9	119	9	9	137	9	8	142
34	8	6	121	6	8	149	9	8	120	9	8	138	9	8	143
35	8	12	123	0	17	141	9	17	121	9	17	139	9	16	144
36	8	6	119	0	9	124	9	8	113	9	9	131	9	8	137
37	4	6	117	0	9	115	9	9	114	9	9	131	9	9	138
38	8	13	119	9	18	115	9	18	114	9	18	131	0	18	129
39	8	7	114	9	9	106	9	9	105	9	9	122	0	9	111
40	8	7	115	9	9	106	9	0	105	9	9	122	0	9	102
41	8	8	116	9	9	106	9	0	114	9	0	122	0	9	93
42	8	8	116	9	9	106	9	7	123	9	9	131	0	9	84
43	8	8	116	9	9	106	9	7	125	9	9	131	0	2	75
44	8	8	116	8	9	105	8	9	126	8	9	130	0	9	73
45	7	16	115	8	19	104	8	10	125	8	14	129	0	19	64
46	7	0	106	8	0	93	8	0	123	8	0	123	0	0	45
47	6	8	112	5	9	99	5	9	129	6	9	129	0	9	45
48	6	8	110	6	6	96	6	9	126	6	9	126	0	9	36
49	6	8	108	6	0	96	6	9	123	6	9	123	0	9	27
50	6	8	106	6	0	102	6	9	120	6	9	120	0	9	18
51	6	4	104	6	0	104	6	9	117	6	9	117	0	9	9
52	6	8	106	6	9	114	6	9	114	6	9	114	0	0	0

Figure 5.4

PROGRAM IN LOGISTICS
INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING
THE GEORGE WASHINGTON UNIVERSITY

TRANS RUN 6 SCHEDULE OF HOLDOVERS FROM _____ 02/25/79

	PR-WHITING					FR-CORPUS					H"			*		IS-CORPUS					IS-WHITING				
WEEK	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5	YR1	YR2	YR3	YR4	YR5
01-02	0	294	18	20	20	0	64	0	0	0	40	95	0	0	0	0	23	9	27	31	5	30	17	17	13
02-03	0	278	0	0	0	0	57	0	0	0	34	88	0	0	0	0	15	1	19	23	6	32	19	19	15
03-04	0	287	0	0	0	0	58	0	0	0	33	81	0	0	0	0	15	1	19	23	7	34	21	21	17
04-05	0	291	1	0	0	0	60	0	0	0	42	74	0	0	0	0	15	1	19	23	8	31	18	18	14
05-06	0	295	9	2	0	0	55	0	0	0	50	67	0	0	0	0	15	1	19	23	9	32	19	19	15
06-07	1	297	18	14	5	0	54	0	0	0	59	64	0	0	0	0	7	0	11	15	10	33	20	20	16
07-08	5	304	26	25	15	2	55	0	0	0	68	63	0	0	0	0	7	0	11	15	10	29	16	16	12
08-09	9	291	11	10	0	5	51	0	0	0	78	63	0	0	0	0	7	0	11	15	10	29	16	16	12
09-10	12	302	17	19	6	7	52	0	0	0	88	63	0	0	0	0	0	0	3	7	10	29	16	16	12
10-11	17	305	23	28	14	10	49	0	0	0	96	63	0	0	0	0	0	0	3	7	10	29	16	16	12
11-12	27	292	6	16	4	13	51	0	0	0	101	63	0	0	0	0	0	0	3	7	10	25	12	12	8
12-15	41	290	12	21	11	16	53	0	0	0	101	63	0	0	0	0	0	0	0	0	10	25	12	12	8
15-16	45	275	0	3	0	19	49	0	0	0	101	63	0	0	0	0	0	0	0	0	10	24	11	11	7
16-17	55	257	1	6	0	20	44	0	0	0	101	63	0	0	0	0	0	0	0	0	9	20	7	7	3
17-18	55	242	0	7	0	21	42	0	0	0	101	55	0	0	0	0	0	0	0	0	8	19	6	6	2
18-19	65	219	8	8	9	22	36	0	0	0	101	52	0	0	0	0	0	0	0	0	7	18	5	5	1
19-20	72	196	0	0	0	23	30	0	0	0	101	44	0	0	0	0	0	0	0	0	6	14	1	1	0
20-21	80	175	0	0	0	25	25	0	0	0	101	44	0	0	0	0	0	0	0	0	5	13	0	0	0
21-22	91	155	0	0	0	27	22	0	0	0	101	44	0	0	0	0	0	0	0	0	4	12	0	0	0
22-23	96	153	2	2	0	27	26	0	0	0	101	44	0	0	0	0	0	0	0	0	3	11	0	0	0
23-24	100	151	13	13	0	23	20	0	0	0	104	44	0	0	0	0	0	0	0	0	1	9	0	0	0
24-25	102	145	21	17	8	22	23	0	0	0	101	44	0	0	0	0	0	0	0	0	0	7	0	0	0
25-26	85	129	0	0	0	22	26	0	0	0	101	44	0	0	0	0	0	0	0	0	0	5	0	0	0
26-27	97	125	2	2	0	21	29	0	0	0	101	44	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	96	131	1	1	0	20	32	0	0	0	106	44	0	0	0	2	3	3	3	3	0	0	0	0	0
28-29	100	129	0	0	0	18	25	0	0	0	102	44	0	0	0	0	0	0	0	0	1	1	1	1	1
29-30	111	144	0	0	0	19	36	0	0	0	105	44	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	112	144	0	0	0	19	43	0	0	0	101	44	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	126	133	0	0	0	19	47	0	0	0	101	43	0	0	0	2	0	4	4	4	0	0	0	0	0
32-33	148	125	0	0	0	21	51	0	0	0	104	34	0	0	0	0	0	1	1	1	1	2	2	2	2
33-34	151	116	0	0	0	24	53	0	0	0	104	25	0	0	0	1	0	4	4	4	3	10	1	1	1
34-35	171	110	0	0	0	25	63	0	0	0	101	16	0	0	0	0	0	0	0	0	2	14	0	0	0
35-36	165	100	0	0	0	25	64	0	0	0	108	8	0	0	0	0	0	0	0	0	5	22	2	3	3
36-37	175	94	0	0	0	29	75	0	0	0	102	0	0	0	0	2	0	0	4	0	4	26	0	0	0
37-38	166	83	0	0	0	29	74	0	0	0	101	0	0	0	0	6	4	6	10	0	7	29	1	1	0
38-39	179	72	0	0	0	33	65	0	0	0	101	0	0	0	0	3	2	4	8	0	6	28	0	0	0
39-40	175	61	0	0	0	33	56	0	0	0	101	0	0	0	0	0	0	2	6	0	10	33	0	0	0
40-41	200	62	12	12	0	34	47	0	0	0	101	0	0	0	0	5	4	9	13	0	10	34	0	0	0
41-42	189	50	0	0	0	37	41	0	0	0	101	0	0	0	0	3	2	7	11	0	11	35	0	0	0
42-43	223	39	0	0	0	36	29	0	0	0	101	0	0	0	0	2	1	6	10	0	12	36	0	0	0
43-44	232	30	0	0	0	44	20	0	0	0	101	0	0	0	0	1	0	5	9	0	18	36	5	1	0
44-45	243	21	3	4	0	51	11	0	0	0	101	0	0	0	0	9	0	13	17	0	19	32	6	2	0
45-46	249	15	14	14	0	52	5	0	0	0	101	0	0	0	0	10	0	14	18	0	20	28	7	3	0
46-47	237	3	0	0	0	51	10	0	0	0	101	0	0	0	0	11	0	15	19	0	21	24	8	4	0
47-48	248	3	0	0	0	52	2	0	0	0	101	0	0	0	0	13	0	17	21	0	23	21	10	6	0
48-49	254	0	0	0	0	51	2	0	0	0	101	0	0	0	0	15	1	19	23	0	25	18	12	8	0
49-50	259	0	0	0	0	57	0	0	0	0	101	0	0	0	0	17	3	21	25	0	27	15	14	10	0
50-51	263	0	0	0	0	57	0	0	0	0	101	0	0	0	0	19	5	23	27	0	29	16	16	12	0
51-52	274	0	0	0	0	60	0	0	0	0	101	0	0	0	0	21	7	25	29	0	26	13	13	9	0
52-01	283	9	9	6	0	63	0	0	0	0	101	0	0	0	0	14	0	18	22	0	28	15	15	11	0
TOTALS	60827422		227	250	92	12841882		0	0	0	46551734		0	0	0	156	136	229	429	201	466	998	345	306	174

Figure 5.5

FROM	TO	NEXT-FROM	NEXT-TO	CIJ					XIJ					TIJ	PHASE	INDEX
A34	Y38	1371	2081	19	18	14	14	14	13	6	9	9	0	4	6	841
A35	Y39	1372	2082	19	18	14	14	14	13	10	9	9	0	4	6	842
A36	Y40	1373	2083	19	18	14	14	14	15	6	9	9	0	4	6	843
A37	Y41	1374	2084	19	18	14	14	14	16	11	11	11	0	4	6	844
A38	Y42	1375	2085	19	18	14	14	14	19	11	14	14	0	4	6	845
A39	Y44	1376	2087	15	16	11	11	11	15	11	8	8	0	5	6	846
A40	Y45	1377	848	15	16	11	11	11	11	11	6	6	0	5	6	847
A41	Y45	1378	2088	19	20	14	14	14	0	0	0	0	0	4	6	848
A42	Y46	1379	2089	19	20	14	14	14	11	11	6	6	0	4	6	849
A43	Y47	1380	2090	19	20	14	14	14	10	9	6	6	0	4	6	850
A44	Y48	1381	2091	19	20	14	14	14	9	9	6	6	0	4	6	851
A45	Y49	1382	2092	19	20	14	14	14	18	9	14	14	0	4	6	852
A46	Y51	1383	2094	15	16	11	11	11	9	9	5	5	0	5	6	853
A47	Y52	1384	2095	15	16	11	11	11	11	0	7	7	0	5	6	854
A48	Y01	1385	2096	15	16	11	11	11	15	7	7	7	0	5	6	855
A49	Y02	1386	860	15	16	11	11	11	14	7	7	7	0	5	6	856
A50	Y03	1387	861	15	16	11	11	11	14	7	7	7	0	5	6	857
A51	Y04	1388	862	15	16	11	11	11	14	15	7	7	0	5	6	858
A52	Y05	1389	863	15	16	11	11	11	15	7	11	7	0	5	6	859
S00	Y02	861	2097	12	0	0	0	0	12	0	0	0	0	1	6	860
S00	Y03	862	2048	12	0	0	0	0	12	0	0	0	0	2	6	861
S00	Y04	863	2049	12	0	0	0	0	12	0	0	0	0	3	6	862
S00	Y05	914	2050	12	0	0	0	0	12	0	0	0	0	4	6	863
D01	E27		865	6	6	6	6	6	6	6	6	6	6	24	7	864
D02	E27			6	7	7	7	7	6	7	7	7	7	23	7	865
D03	E28			6	7	7	7	7	6	7	7	7	7	23	7	866
D04	E29			6	7	7	7	7	6	7	7	7	7	23	7	867
D05	E30			6	7	7	7	7	6	7	7	7	7	23	7	868
D06	E31		870	6	7	7	7	7	6	3	7	7	7	23	7	869
D07	E31			6	7	7	7	7	6	7	7	7	7	22	7	870
D08	E32			6	7	7	7	7	6	7	7	7	7	22	7	871
D09	E33		873	6	7	7	7	7	6	0	7	7	7	22	7	872
D10	E33			6	7	7	7	7	6	0	7	7	7	21	7	873
D11	E34			6	7	7	7	7	6	0	7	7	7	21	7	874
D12	E35			6	7	7	7	7	6	0	7	7	7	21	7	875
D15	E36		877	6	7	7	7	7	6	0	5	7	6	21	7	876
D16	E36			7	8	8	8	8	7	0	6	8	5	20	7	877
D17	E37		879	7	8	8	8	8	7	8	8	8	0	20	7	878
D18	E37			7	8	8	8	8	7	6	8	8	0	19	7	879
D19	E38			7	8	8	8	8	7	8	8	8	0	19	7	880
D20	E39			7	8	8	8	8	7	8	8	8	0	19	7	881
D21	E40		883	7	8	8	8	8	7	8	8	8	0	19	7	882
D22	E40			7	8	8	8	8	7	5	8	8	0	18	7	883
D23	E41			8	8	8	8	8	8	8	8	8	0	18	7	884
D24	E42			8	8	8	8	8	8	8	8	8	0	18	7	885
D25	E43			8	8	8	8	8	8	8	8	8	0	18	7	886
D26	E44		888	8	8	8	8	8	8	8	8	8	0	18	7	887
D27	E44			9	9	9	9	9	9	1	9	9	0	17	7	888
D28	E45			9	9	9	9	9	9	8	9	9	0	17	7	889
D29	E46			9	9	9	9	9	9	8	9	9	0	17	7	890
D30	E47			9	9	9	9	9	9	7	9	9	0	17	7	891
D31	E48			9	9	9	9	9	9	8	9	9	0	17	7	892
D32	E49			9	9	9	9	9	9	9	9	9	0	17	7	893
D33	E50			9	9	9	9	9	9	9	9	9	0	17	7	894
D34	E51			9	9	9	9	9	9	9	9	9	0	17	7	895
D35	E01		897	8	8	8	8	8	8	8	8	8	0	18	7	896
D36	E01		1541	9	9	9	9	9	9	9	9	9	0	17	7	897
D37	E03		915	8	8	8	8	8	8	8	8	8	0	18	7	898
D38	E04		916	8	8	8	8	8	8	8	8	8	0	18	7	899
D39	E05		917	8	8	8	8	8	8	8	8	8	0	18	7	900

Figure 5.6

pipeline graduate basis. Any of these numbers can then be inflated by the appropriate downstream attrition to convert them to actual on board students.

5.7 Figure 5.7 - Unused Capacity - This is an example from the listing that contains the unused capacity to train by week for a five-year period. On the left is the abbreviated phase name (MT: Maritime; PH: Primary Helo; AH: Advanced Helo). The next two columns contain the FROM and TO nodes described for Figure 5.5. The next five columns contain the unused capacity. The sixth column is the phase length in weeks. The last column is of GWU interest only. Unless there is an unused capacity sometime during the five years, a particular line is not printed. Since PH has an unused capacity for only one phase entry date, i.e., Y01, this quickly identifies PH as a bottleneck phase.

1	MT	N45	P11	0	0	0	0	8	18	111
1	MT	N46	P12	0	0	0	0	8	18	111
1	MT	N47	P16	0	0	0	0	6	21	111
1	MT	N48	P17	0	0	0	0	6	21	111
1	MT	N49	P19	0	0	0	0	6	22	111
1	MT	N50	P20	0	0	0	0	6	22	111
1	MT	N51	P21	0	0	0	0	6	22	111
1	MT	N52	P22	0	0	0	0	6	22	111
1	PH	Y01	R06	6	0	0	0	0	5	121
1	AH	R01	H16	7	0	0	8	8	13	131
1	AH	R02	H18	0	0	0	8	8	14	131
1	AH	R03	H19	0	0	0	8	8	14	131
1	AH	R04	H20	0	0	0	8	8	14	131
1	AH	R05	H21	0	0	3	8	8	14	131
1	AH	R06	H22	0	0	8	8	8	14	131
1	AH	R07	H23	0	1	8	8	8	14	131
1	AH	R08	H24	0	1	8	8	8	14	131
1	AH	R09	H25	0	1	8	8	8	14	131
1	AH	R10	H26	0	1	8	8	8	14	131
1	AH	R11	H27	3	8	8	8	8	14	131
1	AH	R12	H28	3	2	8	8	8	14	131
1	AH	R15	H28	3	2	8	8	8	13	131
1	AH	R16	H29	3	2	8	8	8	13	131
1	AH	R17	H29	4	3	9	9	9	12	131
1	AH	R18	H30	4	3	9	9	9	12	131
1	AH	R19	H31	4	3	9	9	9	12	131
1	AH	R20	H31	5	4	10	10	10	11	131
1	AH	R21	H32	5	4	10	10	10	11	131
1	AH	R22	H33	0	0	10	10	10	11	131
1	AH	R23	H34	5	0	10	10	10	11	131

Figure 5.7

REFERENCES

[1] FORD, L.R., JR. and D. R. FULKERSON (1962). Flows in Networks. Princeton University Press, Princeton, New Jersey.

[2] CAVES, WILLIAM E. and W. L. WILKINSON (1977). Dynamic flight student flow model. Technical Paper Serial T-362. Program in Logistics, The George Washington University.

[3] JEWELL, W. S. (1960). Optimal flow through networks with gains. Second International Conference on Operations Research. Aix-en-Provence, France.

APPENDIX A

This appendix contains the stepwise hand calculations for determining the fraction of aircraft to be assigned to the different phases of flight training when the same type aircraft is being shared among phases at the same location. As will be seen, this proportioning depends on the pipeline proportioning and what phases are to be in operation. This proportioning is not done in real life unless different squadron commands are involved. It is only necessary for computing phase capacities for the DSFM.

APPENDIX A

Proportioning Aircraft Assignments

1. Rationale for determining the division of aircraft among Phased Primary, Primary, and Intermediate Maritime/Helo.

D A T A

Average Flight Hours Required per Phase Graduate

	Phased Primary	Primary	Intermediate Maritime/Helo
T28	42.5	86.2	29.8
T34C	43.1	109.5	38.4
T34C with 2B37	43.1	87.0	29.9

With reference to the Downstream Attrition chart:

36.8% of students entering flight training go to JET pipeline*

63.2% of students go to MARITIME and HELO pipelines.

For T28s then, the average student would get:

36.8% × 42.5 hrs. in Phased Primary	15.6 hrs./avg. student
63.2% × 116.0 hrs. in Primary and Intermediate	73.1 hrs./avg. student
	88.7 hrs./avg. student

Therefore:

15.6/88.7 = 17.6% of the aircraft should be assigned to Phased Primary

73.1/88.7 = 82.4% should be assigned to Primary and Intermediate.

Similarly for the T34C without the 2B37:

36.8% × 43.1 = 15.9 hrs.

63.2% × 147.9 = 93.5 hrs.

109.4 hrs./avg. student

---

*This includes those attrites associated with JET pipeline including those attritions early in the flight training program.

15.9/109.4 = 14.5% assigned to Phased Primary

93.5/109.4 = 85.5% assigned to Primary and Intermediate.

And for T34C with the 2B37:

36.8% × 43.1 = 15.9 hrs.

63.2% × 116.9 = <u>73.9</u> hrs.

89.8 hrs./avg. student

15.9/89.8 = 17.8% assigned to Phased Primary

73.9/89.8 = 82.3% assigned to Primary and Intermediate.

The breakout between Primary and Intermediate aircraft is determined in the following way. The in-phase attrition for the Intermediate phase is 2%. Therefore, Primary has to produce 1.02 phase graduates for every Intermediate graduate. The total time, then, for an average Primary/Intermediate graduate would be 1.02 times the Primary flight hours plus the flight hours for an Intermediate graduate. The following calculations give the respective allocations.

<u>T28</u>

86.2 hrs. × 1.02 = 87.9 hrs. for Primary

<u>29.8</u> hrs. for Intermediate

117.7 hrs. for average Primary/Intermediate graduate

(87.9/117.7) × 82.4% = 61.5% assigned as Primary aircraft

(29.8/117.7) × 82.4% = 20.9% assigned as Intermediate aircraft.

<u>T34C without the 2B37</u>

109.5 hrs. × 1.02 = 111.7 hrs. for Primary

<u>38.4</u> hrs. for Intermediate

150.1 hrs. for average Primary/Intermediate graduate

(111.7/150.1) × 85.5% = 63.6% assigned as Primary aircraft

(38.4/150.1) × 85.5% = 21.9% assigned as Intermediate aircraft.

T34C with 2B37

87.0 hrs. × 1.02 = 88.7 hrs. for Primary
29.9 hrs. for Intermediate
118.6 hrs. for average Primary/Intermediate graduate

(88.7/118.6) × 82.3% = 61.6% assigned as Primary aircraft
(29.9/118.6) × 82.3% = 20.7% assigned as Intermediate aircraft.

2. When the Phased Primary is discontinued, the division of aircraft will be between Primary and Intermediate. The average flight hours required per phase graduate for Primary and Intermediate are the same as before but the pipeline division of students will be different because the JET pipeline will now suffer a higher attrition. So,

38.4% go to JET pipeline, and
61.6% go to MARITIME and HELO.

Therefore:

T28

100% of students get 86.2 hours in Primary	86.2 hrs.
61.6% of students get 29.8 hours in Intermediate	18.4 hrs.
	104.6 hrs./avg. student

86.2/104.6 = 82.4% assigned as Primary aircraft
18.4/104.6 = 17.6% assigned as Intermediate aircraft.

T34C without the 2B37

100% of students get 109.5 hours in Primary	109.5 hrs.
61.6% of students get 38.4 hours in Intermediate	23.7 hrs.
	133.2 hrs./avg. student

109.5/133.2 = 82.2% assigned as Primary aircraft
23.7/133.2 = 17.5% assigned as Intermediate aircraft.

T34C with 2B37

100% of students get 87.0 hours in Primary	87.0 hrs.
61.6% of students get 29.9 hours in Intermediate	18.4 hrs.
	105.4 hrs./avg. student

87.0/105.4 = 82.5% assigned as Primary aircraft

18.4/105.4 = 17.5% assigned as Intermediate aircraft.

SUMMARY TABLE OF AIRCRAFT ALLOCATION BY PERCENT

With Phased Primary	Phased Primary	Primary	Intermediate
T28	17.6	61.5	20.9
T34C without 2B37	14.5	63.6	21.9
T34C with 2B37	17.7	61.6	20.7
Without Phased Primary			
T28		82.4	17.6
T34C without 2B37		82.2	17.8
T34C with 2B37		82.5	17.5

3. Whenever the support for the UHPT pipeline is no longer required, the T28s and T34Cs will be distributed between Primary and Intermediate Maritime. At that time, the Primary phase will be received by 100% of the students. Of the Primary graduates, 63% must go to the Jet pipeline and 37% go to the Prop pipeline to achieve the proper balance of 60% and 40% of the UPT graduates, respectively. The 60% and 40% were obtained by averaging the PTRs over the next five years.

Total hours required for a Primary phase graduate in the T34C with the 2B37 is 87.0. For the Intermediate Maritime phase it is 29.9. Therefore:

100% × 87.0 hours in Primary	87.0 hrs./avg. student
37% × 29.9 hours in Intermediate Maritime	11.1 hrs./avg. student

and

87.0/98.1 = 88.7% of the T34Cs assigned to Primary

11.1/98.1 = 11.3% of the T34Cs assigned to Intermediate Maritime.

Distributions for the T28 are not significantly different.

APPENDIX B

DETERMINING WEEKLY PHASE CAPACITIES TO TRAIN

The accompanying work sheets are examples of how the weekly phase capacities to train are manually calculated. The first column after the PHASE NAME is the range of weeks to train as calculated by the DSFM in the network setup phase. One looks down the right-hand column of the listing, e.g., Figure 3-13, to find the largest and smallest number for each phase. The ratio (next column) of the Average to the Actual Weeks becomes the multiplier for the average capacity to train (per week). A new column to the right is calculated every time the average capacity to train changes.

During the course of developing this report, the manual process was automated but the hand calculations are still appropriate for some applications.

WHITING - FY79

PHASE NAME	Range of Weeks to Train	Ratio: Average to Actual Weeks	<------------- Pipeline Grads per Week ------------> Q1	Q2	Q3	Q4			
Phased	6	1.33	11	11					
Primary (PP)	7	1.14	9	9					
	(8)	1.00	(8.0)	(8.3)	0	0			
	9	.88	7	7					
	10	.80	6	7					
	11	.73	6	6					
Primary	12	1.33	20	21	28	28			
	13	1.23	19	20	26	26			
	14	1.14	18	18	24	24			
	15	1.07	16	17	22	23			
	(16)	1.00	(15.4)	(16.0)	(20.8)	(21.1)			
	17	.94	14	15	20	20			
	18	.89	14	14	19	19			
	19	.84	13	13	17	18			
	20	.80	12	13	17	17			
	21	.76	12	12	16	16			
Intermediate	3	1.67	26	27	23	23			
(IP)	4	1.25	19	20	17	17			
	(5)	1.00	(15.5)	(16.3)	(13.5)	(13.5)			
	6	.83	13	14	11	11			
	7	.71	11	12	10	10			

Note: Numbers in parentheses are average values.

WHITING - FY80

PHASE NAME	Range of Weeks to Train	Ratio: Average to Actual Weeks	Q1	Q2	Q3	Q4			
			<------------- Pipeline Grads per Week ------------>						
Phased	6	1.33							
Primary (PP)	7	1.14							
	(8)	1.00	0	0	0	0			
	9	.88							
	10	.80							
	11	.73							
Primary (PR)	12	1.33	23	25	26	29			
	13	1.23	22	23	24	27			
	14	1.14	20	21	23	25			
	15	1.07	19	20	21	24			
	(16)	1.00	(17.5)	(18.6)	(19.8)	(22.1)			
	17	.94	16	17	19	21			
	18	.89	16	17	18	20			
	19	.84	15	16	17	19			
	20	.80	14	15	16	18			
	21	.76	13	14	15	17			
Intermediate	3	1.67	19	20	22	24			
(IP)	4	1.25	14	15	16	18			
	(5)	1.00	(11.5)	(11.8)	(13.0)	(14.3)			
	6	.83	10	10	11	12			
	7	.71	8	8	9	10			

Note: Numbers in parentheses are average values.

WHITING - FY81 & FY82+

PHASE NAME	Range of Weeks to Train	Ratio: Average to Actual Weeks	<------------- Pipeline Grads per Week Q1	Q2	Q3	Q4		FY82+ -------->
Phased	6	1.33						
Primary (PP)	7	1.14						
	(8)	1.00	0	0	0	0		0
	9	.88						
	10	.80						
	11	.73						
Primary (PR)	12	1.33	32	33	32	32		32
	13	1.23	30	30	30	30		29
	14	1.14	28	28	28	28		27
	15	1.07	26	26	26	26		25
	(16)	1.00	(24.4)	(24.6)	(24.3)	(24.3)		(23.8)
	17	.94	23	23	23	23		22
	18	.89	22	22	22	22		21
	19	.84	20	21	20	20		20
	20	.80	19	20	19	19		19
	21	.76	18	19	18	18		18
Intermediate	3	1.67	17	17	17	17		17
(IP)	4	1.25	13	13	13	13		13
	(5)	1.00	(10.0)	(9.9)	(9.9)	(9.9)		(9.9)
	6	.83	8	8	8	8		8
	7	.71	7	7	7	7		7

Note: Numbers in parentheses are average values.

CORPUS - FY79

PHASE NAME	Range of Weeks to Train	Ratio: Average to Actual Weeks	<------------ Pipeline Grads per Week ------------> Q1	Q2	Q3	Q4			
Phased	6	1.33	3	3					
Primary (PP)	7	1.14	3	3					
	(8)	1.00	(2.2)	(2.2)	0	0			
	9	.88	2	2					
	10	.80	2	2					
	11	.73	2	2					
Primary (PR)	12	1.33	6	6	7	7			
	13	1.23	6	6	7	7			
	14	1.14	5	5	6	6			
	15	1.07	5	5	6	6			
	(16)	1.00	(4.5)	(4.5)	(5.6)	(5.6)			
	17	.94	4	4	5	5			
	18	.89	4	4	5	5			
	19	.84	4	4	5	5			
	20	.80	3	3	4	4			
	21	.76	3	3	4	4			
Intermediate	3	1.67	7	7	7	7			
(IP)	4	1.25	6	6	5	5			
	(5)	1.00	(4.4)	(4.4)	(4.0)	(4.0)			
	6	.83	4	4	3	3			
	7	.71	3	3	3	3			

Note: Numbers in parentheses are average values.

CORPUS - FY80 & FY81+

PHASE NAME	Range of Weeks to Train	Ratio: Average to Actual Weeks	Pipeline Grads per Week Q1	Q2	Q3	Q4		FY81+
Phased	6	1.33						
Primary (PP)	7	1.14						
	(8)	1.00	0	0	0	0		0
	9	.88						
	10	.80						
	11	.73						
Primary (PR)	12	1.33	13	13	13	13		
	13	1.23	12	12	12	12		
	14	1.14	11	11	11	11		
	15	1.07	11	11	11	11		
	(16)	1.00	(10.0)	(10.0)	(9.9)	(9.9)		0
	17	.94	9	9	9	9		
	18	.89	9	9	9	9		
	19	.84	8	8	8	8		
	20	.80	8	8	8	8		
	21	.76	8	8	8	8		
Intermediate	3	1.67	11	11	11	11		
(IP)	4	1.25	8	8	8	8		
	(5)	1.00	(6.4)	(6.4)	(6.4)	(6.4)		0
	6	.83	5	5	5	5		
	7	.71	5	5	5	5		

Note: Numbers in parentheses are average values.

PHASE NAME	Range of Weeks to Train	Ratio: Average to Actual Weeks	<------------ Pipeline Grads per Week ------------>						
			Total: Kings plus Chase	Total: Merid plus Pensac					
Intermediate	17	1.18	8	4	9	5			
Strike (IS)	18	1.11	7	4	8	5			
	19	1.05	7	4	8	4			
	(20)	1.00	(6.7)	(3.7)	(7.4)	(4.2)			
	21	.95	6	3	7	4			
	22	.91	6	3	7	4			
	23	.87	6	3	6	4			
	24	.83	6	3	6	3			
	25	.80	5	3	6	3			
Advanced	15	1.20	9	4	10	5			
Strike (AS)	16	1.13	9	4	9	5			
	17	1.06	8	4	9	4			
	(18)	1.00	(7.8)	(3.5)	(8.3)	(4.2)			
	19	.95	7	3	8	4			
	20	.90	7	3	7	4			
	21	.86	7	3	7	4			
	22	.82	6	3	7	3			
	23	.78	6	3	6	3			

Note: Numbers in parentheses are average values.

PHASE NAME	Range of Weeks to Train	Ratio: Average to Actual Weeks	<------- Pipeline Grads per Week -------> FY79 Q1	FY79 Q2	FY79 Q3	FY79 Q4	FY80 Q1	FY80 Q2	FY80+
Maritime (MT)	14	1.21	6	7	8	9	9	10	10
	15	1.13	6	7	8	9	9	9	9
	16	1.06	5	6	7	8	8	9	9
	(17)	1.00	(5.0)	(5.9)	(6.8)	(7.7)	(7.7)	(8.1)	(8)
	18	.94	5	6	6	7	7	8	8
	19	.89	4	5	6	7	7	7	7
	20	.85	4	5	6	7	7	7	7
	21	.81	4	5	5	6	6	6	6
	22	.77	4	5	5	6	6	6	6
Primary Helo	4	1.25	7	7	8	10	10	10	10
(PH)	(5)	1.00	(5.8)	(5.8)	(6.1)	(7.8)	(7.8)	(8.1)	(8)
	6	.83	5	5	5	6	6	7	7
	7	.71	4	4	4	6	6	6	6
Advanced Helo	9	1.22	11	11	11	11	11	11	11
(AH)	10	1.10	10	10	10	10	10	10	10
	(11)	1.00	(8.8)	(8.8)	(8.8)	(8.8)	(8.8)	(8.8)	(9)
	12	.92	8	8	8	8	8	8	8
	13	.85	7	7	7	7	7	7	7
	14	.79	7	7	7	7	7	7	7

Note: Numbers in parentheses are average values.

APPENDIX C

This appendix contains the Executive and Staff Summaries for Scenario Numbers 1 through 6. They are included among the routine outputs of the DSFM. Other outputs are on file but are far too voluminous for inclusion in this report. Their contents are described in Section 5 of the main body of the report.

03/14/79 **PATHFINDER** 111124

DYNAMIC STUDENT FLOW MODEL

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	437	506	514
CORPUS	280	327	335
WHITING	157	179	179
PROP	330	363	369
HELO	296	405	120
TOTAL	1063	1274	1003
PTRS			
JET	570	506	542
PROP	330	363	369
HELO	574	597	590
TOTAL	1474	1466	1501
SHORTFALLS			
JET	133	0	28
PROP	0	0	0
HELO	278	192	470
TOTAL	411	192	498
INPUTS TO NASC			
CNATRA AOB	1259	1092	947
STUDENT WEEKS IN POOLS	34608	25186	2534

Scenario No. 1

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	16976	6774	0
OUT OF PRIMARY @ CORPUS	1384	2089	C
@ WHITING	7960	11052	332
TOTAL OUT OF PRIMARY	9344	13141	332
OUT OF INTERMEDIATE PROP @ CORPUS	699	743	801
@ WHITING	29	16	C
TOTAL OUT OF INTERMEDIATE PROP	728	759	801
INTO INTERMEDIATE STRIKE @ CORPUS	5246	2046	C
@ WHITING	1338	934	C
TOTAL INTO INTERMEDIATE STRIKE	6584	2980	0
INTO ADVANCED STRIKE @ CORPUS	277	561	543
@ WHITING	570	887	844
TOTAL INTO ADVANCED STRIKE	847	1448	1387
INTO ADVANCED HELO	129	84	14
GRAND TOTAL FOR CNATRA	34608	25186	2534

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	271	0	0
WHITING	211	0	C
CORPUS	60	0	0
PRIMARY	1511	1098	1195
WHITING	1198	805	1195
CORPUS	313	293	C
INTERMEDIATE PROP	718	845	346
WHITING	511	509	346
CORPUS	207	336	0
INTERMEDIATE STRIKE	606	608	604
WHITING	213	215	209
CORPUS	393	393	395
ADVANCED STRIKE	551	545	554
WHITING	193	192	193
CORPUS	358	353	361
MARITIME	323	381	381
PRIMARY RW - WHITING	345	430	C
ADVANCED RW - WHITING	366	421	35

03/14/79 **PATHFINDER** **DYNAMIC STUDENT FLOW MODEL** 111124

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	348	0	0
WHITING	269	0	C
CORPUS	79	0	C
PRIMARY	1461	941	907
WHITING	1144	636	907
CORPUS	317	305	C
INTERMEDIATE PROP	673	811	389
WHITING	479	496	360
CORPUS	194	315	29
INTERMEDIATE STRIKE	582	556	553
WHITING	209	198	191
CORPUS	373	358	362
ADVANCED STRIKE	437	506	514
WHITING	157	179	179
CORPUS	280	327	335
MARITIME	330	363	369
PRIMARY RW - WHITING	356	434	32
ADVANCED RW - WHITING	295	405	120

03/14/79 PATHFINDER DYNAMIC STUDENT FLOW MODEL 111124

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	58	0	0
WHITING	44	0	0
CORPUS	13	0	0
PRIMARY	494	326	344
WHITING	391	222	344
CORPUS	103	104	0
INTERMEDIATE PROP	69	83	34
WHITING	49	51	33
CORPUS	20	32	1
INTERMEDIATE STRIKE	239	231	229
WHITING	85	82	79
CORPUS	154	148	149
ADVANCED STRIKE	178	190	192
WHITING	63	66	66
CORPUS	115	123	125
MARITIME	111	127	128
PRIMARY RW - WHITING	34	43	0
ADVANCED RW - WHITING	73	89	18

03/14/79 PATHFINDER 111/00

DYNAMIC STUDENT FLOW MODEL

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	444	506	542
CORPUS	282	329	358
WHITING	162	177	184
PROP	330	363	369
HELO	312	439	133
TOTAL	1086	1308	1044
PTRS			
JET	570	506	542
PROP	330	363	369
HELO	574	597	590
TOTAL	1474	1466	1501
SHORTFALLS			
JET	126	0	0
PROP	0	0	0
HELO	262	158	457
TOTAL	388	158	457
INPUTS TO NASC			
CNATRA AOB	1309	1089	1004
STUDENT WEEKS IN POOLS	29715	17473	1004

Scenario No. 2

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	13533	2029	0
OUT OF PRIMARY @ CORPUS	1422	2096	C
@ WHITING	6755	8251	253
TOTAL OUT OF PRIMARY	8177	10347	253
OUT OF INTERMEDIATE PROP @ CORPUS	661	1272	113
@ WHITING	25	16	0
TOTAL OUT OF INTERMEDIATE PROP	686	1288	113
INTO INTERMEDIATE STRIKE @ CORPUS	5498	2045	C
@ WHITING	1019	438	0
TOTAL INTO INTERMEDIATE STRIKE	6517	2483	C
INTO ADVANCED STRIKE @ CORPUS	168	147	249
@ WHITING	502	1089	375
TOTAL INTO ADVANCED STRIKE	670	1236	624
INTO ADVANCED HELO	132	90	14
GRAND TOTAL FOR CNATRA	29715	17473	1004

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	274	0	0
WHITING	214	0	C
CORPUS	60	0	0
PRIMARY	1574	1161	1244
WHITING	1235	919	1244
CORPUS	339	242	C
INTERMEDIATE PROP	772	809	391
WHITING	549	518	391
CORPUS	223	291	0
INTERMEDIATE STRIKE	660	569	649
WHITING	234	192	209
CORPUS	426	377	440
ADVANCED STRIKE	576	552	59C
WHITING	199	193	200
CORPUS	377	359	390
MARITIME	322	381	383
PRIMARY RW - WHITING	388	454	C
ADVANCED RW - WHITING	386	463	39

03/14/79 PATHFINDER DYNAMIC STUDENT FLOW MODEL 111700

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	351	0	C
WHITING	272	0	C
CORPUS	79	0	0
PRIMARY	1522	888	1028
WHITING	1191	618	1028
CORPUS	331	270	C
INTERMEDIATE PROP	713	846	387
WHITING	509	542	385
CORPUS	204	304	2
INTERMEDIATE STRIKE	609	521	605
WHITING	220	178	198
CORPUS	389	343	407
ADVANCED STRIKE	444	506	542
WHITING	162	177	184
CORPUS	282	329	358
MARITIME	330	363	369
PRIMARY RW - WHITING	389	464	36
ADVANCED RW - WHITING	312	439	133

03/14/79 PATHFINDER
DYNAMIC STUDENT FLOW MODEL 111700

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	58	0	0
WHITING	44	0	0
CORPUS	13	0	0
PRIMARY	511	322	365
WHITING	403	231	365
CORPUS	108	90	0
INTERMEDIATE PROP	73	84	39
WHITING	52	54	39
CORPUS	21	29	0
INTERMEDIATE STRIKE	254	217	247
WHITING	91	75	80
CORPUS	163	142	167
ADVANCED STRIKE	184	193	203
WHITING	65	67	68
CORPUS	119	126	134
MARITIME	111	127	128
PRIMARY RW - WHITING	38	45	1
ADVANCED RW - WHITING	77	97	20

03/14/79 PATHFINDER DYNAMIC STUDENT FLOW MODEL 112119

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	437	506	540
CORPUS	280	323	345
WHITING	157	183	195
PROP	330	363	369
HELO	296	597	212
TOTAL	1063	1466	1121
PTRS			
JET	570	506	542
PROP	330	363	369
HELO	574	597	590
TOTAL	1474	1466	1501
SHORTFALLS			
JET	133	0	2
PROP	0	0	0
HELO	278	0	378
TOTAL	411	0	380
INPUTS TO NASC			
CNATRA AOB	1295	1246	1047
STUDENT WEEKS IN POOLS	27865	13226	1528

Scenario No. 3

03/14/79 PATHFINDER DYNAMIC STUDENT FLOW MODEL 112119

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	11626	1508	0
OUT OF PRIMARY @ CORPUS	1757	1651	0
@ WHITING	6576	6274	477
TOTAL OUT OF PRIMARY	8333	7925	477
OUT OF INTERMEDIATE PROP @ CORPUS	1281	884	174
@ WHITING	20	35	0
TOTAL OUT OF INTERMEDIATE PROP	1301	919	174
INTO INTERMEDIATE STRIKE @ CORPUS	4730	1021	0
@ WHITING	818	312	0
TOTAL INTO INTERMEDIATE STRIKE	5548	1333	0
INTO ADVANCED STRIKE @ CORPUS	278	217	418
@ WHITING	571	637	217
TOTAL INTO ADVANCED STRIKE	849	854	635
INTO ADVANCED HELO	208	687	242
GRAND TOTAL FOR CNATRA	27865	13226	1528

03/14/79 PATHFINDER 112119

DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	244	0	0
WHITING	187	0	0
CORPUS	57	0	0
PRIMARY	1581	1465	1254
WHITING	1272	1229	1254
CORPUS	309	236	0
INTERMEDIATE PROP	823	995	398
WHITING	599	705	398
CORPUS	224	290	C
INTERMEDIATE STRIKE	607	608	671
WHITING	215	222	231
CORPUS	392	386	440
ADVANCED STRIKE	556	530	616
WHITING	199	201	210
CORPUS	357	329	406
MARITIME	323	380	383
PRIMARY RW - WHITING	422	655	0
ADVANCED RW - WHITING	401	632	88

03/14/79 PATHFINDER 112119

DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	324	0	C
WHITING	247	0	0
CORPUS	77	0	0
PRIMARY	1519	1155	1059
WHITING	1203	900	1059
CORPUS	316	255	C
INTERMEDIATE PROP	746	1037	391
WHITING	538	740	386
CORPUS	208	297	5
INTERMEDIATE STRIKE	583	487	661
WHITING	208	178	233
CORPUS	375	309	428
ADVANCED STRIKE	437	506	540
WHITING	157	183	195
CORPUS	280	323	345
MARITIME	330	363	369
PRIMARY RW - WHITING	408	663	50
ADVANCED RW - WHITING	296	597	212

03/14/79 PATHFINDER 112119

DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	53	0	C
WHITING	40	0	0
CORPUS	12	0	0
PRIMARY	513	404	371
WHITING	411	321	371
CORPUS	102	83	0
INTERMEDIATE PROP	78	102	39
WHITING	56	72	39
CORPUS	21	30	C
INTERMEDIATE STRIKE	240	219	266
WHITING	85	81	93
CORPUS	154	138	173
ADVANCED STRIKE	179	192	201
WHITING	63	70	71
CORPUS	115	121	129
MARITIME	111	127	128
PRIMARY RW - WHITING	40	65	1
ADVANCED RW - WHITING	77	135	37

03/21/79 — PATHFINDER DYNAMIC STUDENT FLOW MODEL — 000801

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	351	506	443
CORPUS	314	506	443
WHITING	37	0	0
PROP	330	363	383
HELO	472	592	608
TOTAL	1153	1461	1434
PTRS			
JET	570	506	560
PROP	330	363	383
HELO	597	597	608
TOTAL	1497	1466	1551
SHORTFALLS			
JET	219	0	117
PROP	0	0	0
HELO	125	5	0
TOTAL	344	5	117
INPUTS TO NASC			
CNATRA AOB	1294	1321	1506
STUDENT WEEKS IN POOLS	25439	13682	8912

Scenario No. 4

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	16587	2670	0
OUT OF PRIMARY @ CORPUS	60	0	0
@ WHITING	1724	5161	5905
TOTAL OUT OF PRIMARY	1784	5161	5905
OUT OF INTERMEDIATE PROP @ CORPUS	419	1464	1022
@ WHITING	67	37	52
TOTAL OUT OF INTERMEDIATE PROP	486	1501	1074
INTO INTERMEDIATE STRIKE @ CORPUS	5564	2927	0
@ WHITING	0	0	C
TOTAL INTO INTERMEDIATE STRIKE	5564	2927	0
INTO ADVANCED STRIKE @ CORPUS	755	855	980
@ WHITING	0	0	0
TOTAL INTO ADVANCED STRIKE	755	855	98C
INTO ADVANCED HELO	263	568	953
GRAND TOTAL FOR CNATRA	25439	13682	8912

PATHFINDER
DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	663	0	0
WHITING	663	0	0
CORPUS	0	0	0
PRIMARY	1316	1899	2153
WHITING	1316	1899	2153
CORPUS	0	0	0
INTERMEDIATE PROP	1078	996	1108
WHITING	1078	996	1108
CORPUS	0	0	0
INTERMEDIATE STRIKE	611	487	717
WHITING	0	0	0
CORPUS	611	487	717
ADVANCED STRIKE	452	500	555
WHITING	0	0	0
CORPUS	452	500	555
MARITIME	339	355	408
PRIMARY RW - WHITING	613	636	670
ADVANCED RW - WHITING	579	624	650

03/21/79 **PATHFINDER** 000801

DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	599	104	0
WHITING	574	104	0
CORPUS	25	0	0
PRIMARY	1294	1416	1777
WHITING	1181	1416	1777
CORPUS	113	0	0
INTERMEDIATE PROP	991	988	1086
WHITING	985	988	1086
CORPUS	6	0	0
INTERMEDIATE STRIKE	495	448	627
WHITING	0	0	0
CORPUS	495	448	627
ADVANCED STRIKE	351	506	443
WHITING	37	0	0
CORPUS	314	506	443
MARITIME	330	363	383
PRIMARY RW - WHITING	597	632	661
ADVANCED RW - WHITING	472	592	608

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	103	8	0
WHITING	101	8	0
CORPUS	2	0	C
PRIMARY	435	515	623
WHITING	413	515	623
CORPUS	21	0	0
INTERMEDIATE PROP	103	99	108
WHITING	103	99	108
CORPUS	0	0	0
INTERMEDIATE STRIKE	220	188	268
WHITING	0	0	0
CORPUS	220	188	268
ADVANCED STRIKE	144	189	168
WHITING	7	0	C
CORPUS	136	189	168
MARITIME	112	124	133
PRIMARY RW - WHITING	60	62	65
ADVANCED RW - WHITING	114	133	137

03/14/79 **PATHFINDER** 112826

DYNAMIC STUDENT FLOW MODEL

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	437	506	513
CORPUS	280	328	334
WHITING	157	178	179
PROP	330	363	369
HELO	296	405	407
TOTAL	1063	1274	1289
PTRS			
JET	570	506	552
PROP	330	363	369
HELO	574	597	655
TOTAL	1474	1466	1576
SHORTFALLS			
JET	133	0	39
PROP	0	0	0
HELO	278	192	248
TOTAL	411	192	287
INPUTS TO NASC			
CNATRA AOB	1262	1191	1130
STUDENT WEEKS IN POOLS	38102	17838	8389

<u>Scenario No. 5</u>

PATHFINDER

03/14/79 **DYNAMIC STUDENT FLOW MODEL** 112826

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	20590	287	0
OUT OF PRIMARY @ CORPUS	1780	2378	379
@ WHITING	8237	9118	1362
TOTAL OUT OF PRIMARY	10017	11496	1741
OUT OF INTERMEDIATE PROP @ CORPUS	1138	3313	5176
@ WHITING	22	8	41
TOTAL OUT OF INTERMEDIATE PROP	1160	3321	5217
INTO INTERMEDIATE STRIKE @ CORPUS	4295	873	0
@ WHITING	1060	305	0
TOTAL INTO INTERMEDIATE STRIKE	5355	1178	0
INTO ADVANCED STRIKE @ CORPUS	281	536	524
@ WHITING	569	937	822
TOTAL INTO ADVANCED STRIKE	850	1473	1346
INTO ADVANCED HELO	130	83	85
GRAND TOTAL FOR CNATRA	38102	17838	8389

03/14/79 PATHFINDER 112826
DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	275	0	0
WHITING	212	0	0
CORPUS	63	0	0
PRIMARY	1493	1507	1356
WHITING	1183	1209	1356
CORPUS	310	298	0
INTERMEDIATE PROP	750	1038	535
WHITING	530	694	535
CORPUS	220	344	0
INTERMEDIATE STRIKE	614	601	601
WHITING	221	208	207
CORPUS	393	393	394
ADVANCED STRIKE	551	547	554
WHITING	194	193	192
CORPUS	357	354	362
MARITIME	325	383	357
PRIMARY RW - WHITING	351	433	439
ADVANCED RW - WHITING	362	422	434

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	352	0	0
WHITING	270	0	0
CORPUS	82	0	0
PRIMARY	1464	1203	1110
WHITING	1151	892	1110
CORPUS	313	311	0
INTERMEDIATE PROP	690	1011	580
WHITING	488	683	551
CORPUS	202	328	29
INTERMEDIATE STRIKE	583	547	558
WHITING	210	189	196
CORPUS	373	358	362
ADVANCED STRIKE	437	506	513
WHITING	157	178	179
CORPUS	280	328	334
MARITIME	330	363	369
PRIMARY RW - WHITING	363	424	436
ADVANCED RW - WHITING	296	405	407

PATHFINDER

03/14/79 DYNAMIC STUDENT FLOW MODEL 112826

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	58	0	0
WHITING	44	0	0
CORPUS	13	0	0
PRIMARY	491	410	393
WHITING	390	310	393
CORPUS	101	99	0
INTERMEDIATE PROP	72	100	54
WHITING	51	67	53
CORPUS	21	33	1
INTERMEDIATE STRIKE	240	228	230
WHITING	86	80	80
CORPUS	154	148	149
ADVANCED STRIKE	178	191	192
WHITING	63	67	66
CORPUS	115	124	125
MARITIME	112	127	126
PRIMARY RW - WHITING	35	42	43
ADVANCED RW - WHITING	73	89	91

PATHFINDER
DYNAMIC STUDENT FLOW MODEL

03/28/79 003325

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	354	506	552
CORPUS	235	334	385
WHITING	119	172	167
PROP	183	338	369
HELO	268	443	464
TOTAL	805	1287	1385
PTRS			
JET	504	506	552
PROP	267	363	369
HELO	506	597	655
TOTAL	1277	1466	1576
SHORTFALLS			
JET	150	0	0
PROP	84	25	0
HELO	238	154	191
TOTAL	472	179	191
INPUTS TO NASC			
CNATRA AOB	1192	1271	1212
STUDENT WEEKS IN POOLS	30405	53625	25245

Scenario No. 6a

03/28/79 **PATHFINDER DYNAMIC STUDENT FLOW MODEL** C03525

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	22070	36765	7051
OUT OF PRIMARY @ CORPUS	599	1616	3756
@ WHITING	2136	4414	6283
TOTAL OUT OF PRIMARY	2735	6030	10039
OUT OF INTERMEDIATE PROP @ CORPUS	140	420	1105
@ WHITING	22	44	11
TOTAL OUT OF INTERMEDIATE PROP	162	464	1116
INTO INTERMEDIATE STRIKE @ CORPUS	3572	4751	2152
@ WHITING	1089	2286	458
TOTAL INTO INTERMEDIATE STRIKE	4661	7037	2610
INTO ADVANCED STRIKE @ CORPUS	225	1502	1981
@ WHITING	486	1446	1617
TOTAL INTO ADVANCED STRIKE	711	2948	3598
INTO ADVANCED HELO	66	381	831
GRAND TOTAL FOR CNATRA	30405	53625	25245

03/28/79 PATHFINDER C03325
DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	342	0	0
WHITING	234	0	0
CORPUS	108	0	0
PRIMARY	844	1646	1364
WHITING	649	1070	886
CORPUS	195	576	478
INTERMEDIATE PROP	549	898	866
WHITING	388	583	529
CORPUS	161	315	337
INTERMEDIATE STRIKE	443	622	620
WHITING	133	200	192
CORPUS	310	422	428
ADVANCED STRIKE	449	556	604
WHITING	145	186	184
CORPUS	304	370	420
MARITIME	194	373	372
PRIMARY RW - WHITING	325	487	488
ADVANCED RW - WHITING	306	461	487

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	332	93	0
WHITING	230	72	0
CORPUS	102	21	0
PRIMARY	946	1406	1186
WHITING	728	941	749
CORPUS	218	465	437
INTERMEDIATE PROP	504	850	858
WHITING	358	558	529
CORPUS	146	292	329
INTERMEDIATE STRIKE	491	598	541
WHITING	177	190	147
CORPUS	314	408	394
ADVANCED STRIKE	354	506	552
WHITING	119	172	167
CORPUS	235	334	385
MARITIME	183	338	369
PRIMARY RW - WHITING	308	481	485
ADVANCED RW - WHITING	268	443	464

03/28/79 **PATHFINDER**
DYNAMIC STUDENT FLOW MODEL 003325

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	76	6	0
WHITING	53	5	0
CORPUS	23	1	0
PRIMARY	390	476	413
WHITING	300	314	267
CORPUS	89	162	146
INTERMEDIATE PROP	71	86	86
WHITING	51	56	54
CORPUS	20	29	32
INTERMEDIATE STRIKE	251	240	224
WHITING	85	75	64
CORPUS	166	165	160
ADVANCED STRIKE	192	194	208
WHITING	62	64	63
CORPUS	129	130	145
MARITIME	85	120	126
PRIMARY RW - WHITING	41	47	48
ADVANCED RW - WHITING	83	98	103

03/28/79 **PATHFINDER** 002844

DYNAMIC STUDENT FLOW MODEL

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	354	506	552
CORPUS	235	334	368
WHITING	119	172	184
PROP	183	338	369
HELO	268	443	464
TOTAL	805	1287	1385
PTRS			
JET	504	506	552
PROP	267	363	369
HELO	506	597	655
TOTAL	1277	1466	1576
SHORTFALLS			
JET	150	0	0
PROP	84	25	0
HELO	238	154	191
TOTAL	472	179	191
INPUTS TO NASC			
CNATRA AOB	1212	1200	1318
STUDENT WEEKS IN POOLS	29978	22581	4501

Scenario No. 6b

03/28/79 **PATHFINDER** C02844

DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	21552	7645	0
OUT OF PRIMARY @ CORPUS	553	1809	373
@ WHITING	1917	4191	845
TOTAL OUT OF PRIMARY	2470	6000	1218
OUT OF INTERMEDIATE PROP @ CORPUS	170	906	513
@ WHITING	21	14	38
TOTAL OUT OF INTERMEDIATE PROP	191	920	551
INTO INTERMEDIATE STRIKE @ CORPUS	3622	4294	0
@ WHITING	1369	1031	0
TOTAL INTO INTERMEDIATE STRIKE	4991	5325	0
INTO ADVANCED STRIKE @ CORPUS	223	893	1418
@ WHITING	485	1299	590
TOTAL INTO ADVANCED STRIKE	708	2192	2008
INTO ADVANCED HELO	66	499	724
GRAND TOTAL FOR CNATRA	29978	22581	4501

03/28/79 PATHFINDER 002844

DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	390	0	0
WHITING	282	0	0
CORPUS	108	0	0
PRIMARY	887	1420	1621
WHITING	682	898	1145
CORPUS	205	522	476
INTERMEDIATE PROP	571	870	907
WHITING	411	550	618
CORPUS	160	320	289
INTERMEDIATE STRIKE	470	613	647
WHITING	161	195	217
CORPUS	309	418	430
ADVANCED STRIKE	452	554	603
WHITING	150	185	202
CORPUS	302	369	401
MARITIME	196	375	374
PRIMARY RW - WHITING	326	486	487
ADVANCED RW - WHITING	306	461	487

03/28/79 PATHFINDER 002344
DYNAMIC STUDENT FLOW MODEL

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	377	93	0
WHITING	275	72	0
CORPUS	102	21	0
PRIMARY	948	1139	1518
WHITING	732	730	1067
CORPUS	216	409	451
INTERMEDIATE PROP	514	850	860
WHITING	363	560	584
CORPUS	151	290	276
INTERMEDIATE STRIKE	488	578	601
WHITING	176	181	196
CORPUS	312	397	405
ADVANCED STRIKE	354	506	552
WHITING	119	172	184
CORPUS	235	334	368
MARITIME	183	338	369
PRIMARY RW - WHITING	309	486	477
ADVANCED RW - WHITING	268	443	464

PATHFINDER

03/28/79 DYNAMIC STUDENT FLOW MODEL C02844

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	85	6	0
WHITING	61	5	0
CORPUS	23	1	0
PRIMARY	393	412	496
WHITING	304	262	354
CORPUS	89	149	142
INTERMEDIATE PROP	74	85	88
WHITING	53	55	60
CORPUS	20	30	27
INTERMEDIATE STRIKE	257	233	246
WHITING	91	73	81
CORPUS	165	160	164
ADVANCED STRIKE	192	194	208
WHITING	63	65	69
CORPUS	129	129	139
MARITIME	86	120	127
PRIMARY RW - WHITING	41	48	47
ADVANCED RW - WHITING	83	93	103

PATHFINDER
DYNAMIC STUDENT FLOW MODEL
LOOKAHEAD #7

T-398

04/03/79

054622

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	354	506	552
CORPUS	235	334	385
WHITING	119	172	167
PROP	183	338	369
HELO	268	443	464
TOTAL	805	1287	1385
PTRS			
JET	504	506	552
PROP	267	363	369
HELO	506	597	655
TOTAL	1277	1466	1576
SHORTFALLS			
JET	150	0	0
PROP	84	25	0
HELO	238	154	191
TOTAL	472	179	191
INPUTS TO NASC			
CNATRA AOB	1229	1281	1185
STUDENT WEEKS IN POOLS	29220	52686	26309

Scenario No. 6c

PATHFINDER
DYNAMIC STUDENT FLOW MODEL
LOOKAHEAD #7

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	20991	32075	5370
OUT OF PRIMARY @ CORPUS	606	1547	3845
@ WHITING ,	2664	8955	8684
TOTAL OUT OF PRIMARY	3270	10502	12529
OUT OF INTERMEDIATE PROP @ CORPUS	142	560	1345
@ WHITING	21	45	11
TOTAL OUT OF INTERMEDIATE PROP	163	605	1356
INTO INTERMEDIATE STRIKE @ CORPUS	3452	5084	1978
@ WHITING	566	962	363
TOTAL INTO INTERMEDIATE STRIKE	4018	6046	2341
INTO ADVANCED STRIKE @ CORPUS	224	1507	1983
@ WHITING	489	1445	1585
TOTAL INTO ADVANCED STRIKE	713	2952	3568
INTO ADVANCED HELO	65	506	1145
GRAND TOTAL FOR CNATRA	29220	52686	26309

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	293	0	0
WHITING	196	0	0
CORPUS	97	0	0
PRIMARY	986	1638	1285
WHITING	792	1062	824
CORPUS	194	576	461
INTERMEDIATE PROP	544	905	860
WHITING	386	587	530
CORPUS	158	318	330
INTERMEDIATE STRIKE	451	622	619
WHITING	141	200	191
CORPUS	310	422	428
ADVANCED STRIKE	448	556	605
WHITING	145	186	184
CORPUS	303	370	421
MARITIME	194	373	374
PRIMARY RW - WHITING	322	496	484
ADVANCED RW - WHITING	306	461	487

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	288	91	0
WHITING	196	70	0
CORPUS	92	21	0
PRIMARY	1019	1470	1102
WHITING	800	1005	678
CORPUS	219	465	424
INTERMEDIATE PROP	502	853	860
WHITING	356	561	534
CORPUS	146	292	326
INTERMEDIATE STRIKE	494	595	541
WHITING	180	187	147
CORPUS	314	408	394
ADVANCED STRIKE	354	506	552
WHITING	119	172	167
CORPUS	235	334	385
MARITIME	183	338	369
PRIMARY RW - WHITING	309	486	494
ADVANCED RW - WHITING	268	443	464

PATHFINDER
DYNAMIC STUDENT FLOW MODEL
LOOKAHEAD #7

04/03/79 054622

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	63	8	0
WHITING	42	7	0
CORPUS	21	1	0
PRIMARY	437	483	385
WHITING	348	321	244
CORPUS	89	162	141
INTERMEDIATE PROP	71	87	87
WHITING	51	57	54
CORPUS	19	29	32
INTERMEDIATE STRIKE	254	240	224
WHITING	88	75	64
CORPUS	166	165	160
ADVANCED STRIKE	192	194	208
WHITING	62	64	63
CORPUS	129	130	145
MARITIME	85	120	127
PRIMARY RW - WHITING	40	48	48
ADVANCED RW - WHITING	83	98	103

PATHFINDER
DYNAMIC STUDENT FLOW MODEL
LOOKAHEAD #6

04/03/79 054338

EXECUTIVE SUMMARY

GRADUATES	1979	1980	1981
JET	354	506	552
CORPUS	235	334	373
WHITING	119	172	179
PROP	183	338	369
HELO	268	443	464
TOTAL	805	1287	1385
PTRS			
JET	504	506	552
PROP	267	363	369
HELO	506	597	655
TOTAL	1277	1466	1576
SHORTFALLS			
JET	150	0	0
PROP	84	25	0
HELO	238	154	191
TOTAL	472	179	191
INPUTS TO NASC			
CNATRA AOB	1245	1183	1318
STUDENT WEEKS IN POOLS	28675	22706	4510

Scenario No. 6d

PATHFINDER
DYNAMIC STUDENT FLOW MODEL
04/03/79 LOOKAHEAD #6 054338

STAFF SUMMARY

STUDENT-WEEKS IN POOLS	1979	1980	1981
AT ENTRY TO PRIMARY/PHASED PRIMARY	20722	5634	0
OUT OF PRIMARY @ CORPUS	555	1609	368
@ WHITING	2402	7549	803
TOTAL OUT OF PRIMARY	2957	9158	1171
OUT OF INTERMEDIATE PROP @ CORPUS	170	1109	599
@ WHITING	21	16	42
TOTAL OUT OF INTERMEDIATE PROP	191	1125	641
INTO INTERMEDIATE STRIKE @ CORPUS	3321	3344	0
@ WHITING	706	730	0
TOTAL INTO INTERMEDIATE STRIKE	4027	4074	0
INTO ADVANCED STRIKE @ CORPUS	225	995	1524
@ WHITING	487	1221	450
TOTAL INTO ADVANCED STRIKE	712	2216	1974
INTO ADVANCED HELO	66	499	724
GRAND TOTAL FOR CNATRA	28675	22706	4510

PATHFINDER
DYNAMIC STUDENT FLOW MODEL
LOOKAHEAD #6

04/03/79 054338

STAFF SUMMARY

STUDENTS INPUT	1979	1980	1981
PHASED PRIMARY	334	0	0
WHITING	226	0	0
CORPUS	108	0	0
PRIMARY	1032	1321	1629
WHITING	833	816	1151
CORPUS	199	505	478
INTERMEDIATE PROP	574	875	895
WHITING	419	552	611
CORPUS	155	323	284
INTERMEDIATE STRIKE	476	609	641
WHITING	163	192	214
CORPUS	313	417	427
ADVANCED STRIKE	438	559	607
WHITING	141	190	197
CORPUS	297	369	410
MARITIME	196	375	374
PRIMARY RW - WHITING	326	486	487
ADVANCED RW - WHITING	306	461	487

STAFF SUMMARY

GRADUATES	1979	1980	1981
PHASED PRIMARY	298	119	0
WHITING	196	98	0
CORPUS	102	21	0
PRIMARY	1018	1126	1511
WHITING	800	732	1064
CORPUS	218	394	447
INTERMEDIATE PROP	506	855	860
WHITING	359	561	589
CORPUS	147	294	271
INTERMEDIATE STRIKE	493	571	601
WHITING	175	171	205
CORPUS	318	400	396
ADVANCED STRIKE	354	506	552
WHITING	119	172	179
CORPUS	235	334	373
MARITIME	183	338	369
PRIMARY RW - WHITING	309	486	477
ADVANCED RW - WHITING	268	443	464

PATHFINDER
DYNAMIC STUDENT FLOW MODEL
04/03/79 LOOKAHEAD #6 054338

STAFF SUMMARY

AVERAGE ONBOARD STUDENT LOAD	1979	1980	1981
PHASED PRIMARY	71	9	0
WHITING	48	7	0
CORPUS	23	1	0
PRIMARY	439	394	496
WHITING	350	250	354
CORPUS	88	144	142
INTERMEDIATE PROP	74	86	87
WHITING	54	55	60
CORPUS	19	30	26
INTERMEDIATE STRIKE	259	232	246
WHITING	91	71	83
CORPUS	167	161	163
ADVANCED STRIKE	189	194	208
WHITING	61	65	67
CORPUS	128	129	141
MARITIME	86	120	127
PRIMARY -RW - WHITING	41	48	47
ADVANCED RW - WHITING	83	98	103

APPENDIX D

ABBREVIATIONS

ADPE	Automated Data Processing Equipment
AH	Advanced Helo
AOC	Aviation Officer Candidate
AS	Advanced Strike
AVROC	Aviation Reserve Officer Candidate
BUPERS	Bureau of Naval Personnel
CNATRA	Chief of Naval Air Training
CNO	Chief of Naval Operations
CV	Aircraft Carrier
DSFM	Dynamic Student Flow Model
FIT	Flight Instrument Trainer
FRS	Fleet Readiness Squadron
GWU	George Washington University
ID	Identification
IP	Intermediate Prop (Maritime/Helo)
IS	Intermediate Strike
IUT	Instructor Under Training
MT	Maritime
NAS	Naval Air Station
NASC	Naval Aviation Schools Command
NATRACOM	Naval Air Training Command
NAVSCOLSCOM	Naval Aviation Schools Command
OFT	Operational Flight Trainer
PH	Primary Helo
PP	Phased Primary
PR	Primary
PTR	Pilot Training Rate
RFT	Ready for Training
RW	Rotary Wing

ABBREVIATIONS

TPOI	Time Period of Interest
UHPT	Undergraduate Helo Pilot Training
UPT	Undergraduate Pilot Training
USCG	United States Coast Guard
USMC	United States Marine Corps
USN	United States Navy

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